DOCUMENT RESUME

ED 070 235 40 EC 050 502

AUTHOR	Heal, Laird W.
TITLE	Evaluating an Integrated Approach to the Management of Cerebral Palsy. Volume I of IV. Final Report.
INSTITUTION	Wisconsin Univ., Eau Claire.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
BUREAU NO	59-2149
PUB DATE	Aug 72
GRANT	OEG-0-9-592149-4540(032)
NOTE	89p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Cerebral Palsy; Children; Cognitive Development; *Exceptional Child Research; Perceptual Motor Coordination; Physically Handicapped; Physical Therapy; Program Descriptions; *Self Care Skills; Socialization; *Training Techniques
IDENTIFIERS	*Conductive Education

ABSTRACT

The integrated Management of Cerebral Palsy (IMCP) project evaluated the effectiveness of a program of conductive education, which was said to involve training motorically disabled children in small, motivating groups of similarly handicapped peers to actively and voluntarily pursue those movements that are both incompatible with reflexes and functional in their self care applications. The project's 13 1/2 hour per day program stressed the development of functional movement, socialization, and academic skills for 10 children (aged from 6 to 14 years) having a measured IQ under 70. The IMCP Ss were compared with 15 conventionally trained (CT) Ss on three basic dimensions of behavioral competence: functional movements, socialization, and cognitive functioning. Data indicated that the CT Ss had higher initial scores on the functional movement variables and registered significantly greater gains on several of them, whereas ICMP Ss evidenced some regression on functional movement variables. On socialization variables the IMCP Ss were comparable to the CT Ss on their initial scores and registered significantly greater gains on two of the seven measures. On cognitive measures the CT Ss had higher initial scores, but both groups made comparable gains. (For related information, see also EC 050 503 through EC 050 505.) (Author/GW)

ED 070235

FINAL REPORT

Volume I of IV

Project Number: 59-2149
Grant Number: OEG-0-9-592149-4540(032)

EVALUATING AN INTEGRATED APPROACH TO THE MANAGEMENT OF CEREBRAL PALSY

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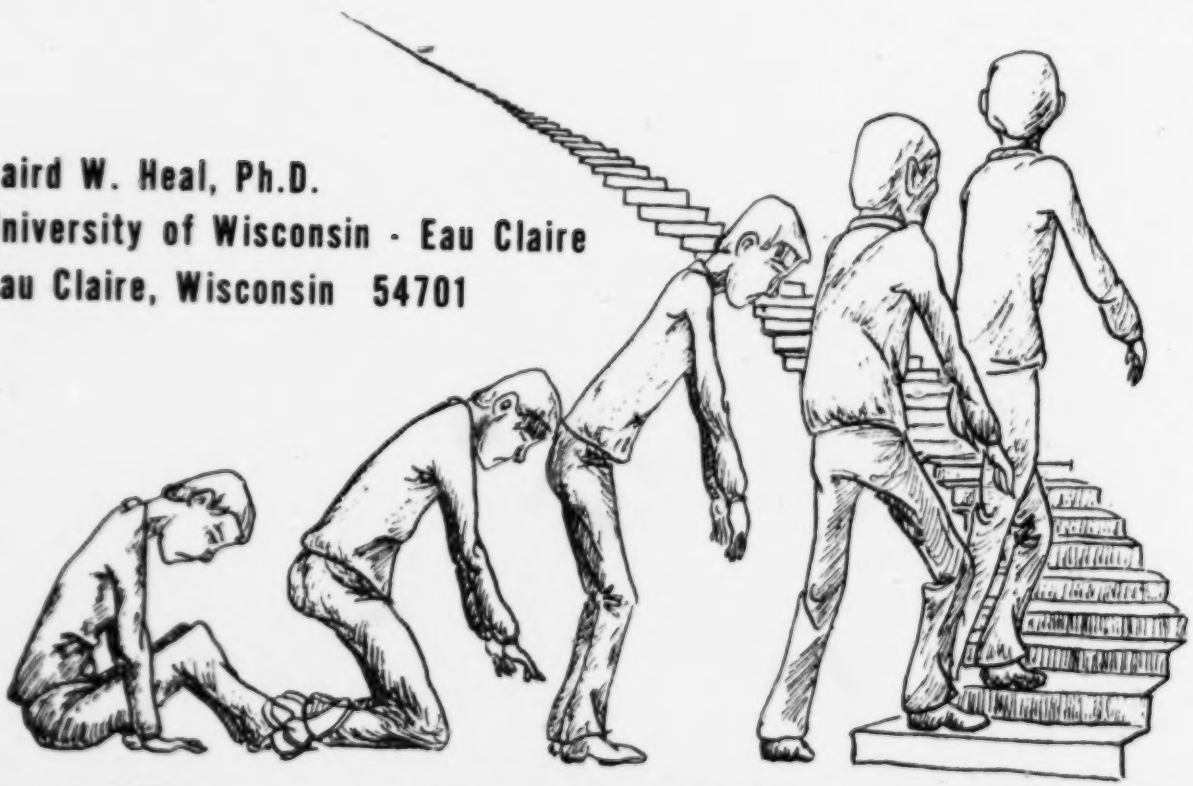

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EC 050 502

August, 1972

Department of Health, Education and Welfare
U.S. Office of Education

ED 070235

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Laird W. Heal, Ph.D.

University of Wisconsin

Eau Claire, Wisconsin

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The research reported herein was performed pursuant to a Grant No. OEG-0-9-592149-4540(032) with the Bureau for the Handicapped, U.S. Office of Education, Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official position of the Bureau of Education for the Handicapped.

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Acknowledgments

The IMCP project has encumbered innumerable debts of gratitude in its short and stormy history. Even the partial list that follows is so lengthy that it dilutes the importance of each contribution far below its real value to the project.

The most important credit goes to the staff, who tumbled out of bed and drove thru blizzards to be on the job at 6:00 a.m. day after day to spend seven hours of strenuous physical and mental labor in the habilitation of their adopted family. Sharon Wolfe, Sheri Gehweiler, Helen Andresen, Hal Sorenson, Judith Sorenson, Ellen Hopfensperger, Nancy Plyer, and Joyce Shuhy were the core staff at the time of the final evaluation. They were preceded by Pearl Piotrowski, Ron Bluel and Kathy Bluel, all of whom participated in the project's early development. Special credit is due to Sharon Wolfe, the project supervisor in its final months, for her many hours of competent dedication to the difficult phasing-out activities, and her innumerable contributions and sacrifices for the project's behalf thru-out its history.

Mrs. Wolfe was preceded by Pearl Piotrowski, whose intellect and energy were lost thru an untimely accident during her Christmas, 1971, vacation. The loss of Pearl was doubly felt, for she was the only member of the staff whose Hungarian was fluent. Conductive Education received a major setback by her death.

The project was unusually fortunate to have the services of two superb secretaries. Julie Hodgson and Carol Hentschel performed superhuman feats of flexibility in serving the secretarial needs of the director, supervisor and six teacher therapists. Julie's many hours of overtime in the preparation of the project's continuation proposal, despite her illness, will never be forgotten. Carol's complete and competent replacement of her secretarial duties and assistance with research duties are witnessed by the technical quality of this report.

There would have been no IMCP project without the tenacity of its founder and original director, James B. House, who overcame overwhelming obstacles in order to introduce conductive education to this country. The talent and energy of Margo House, the project's original supervisor, were also essential to the founding of the program.

The project is grateful to the Chippewa Valley Chapter of United Cerebral Palsy for its financial support in the early phases of the project. The project might never have begun had it not been for the Chapter's funding of the seven months of study in Budapest and England for Pearl Piotrowski and Sheri Gehweiler, and the three months by Margo House.

While the project had little contact with European centers for conductive education, it profited enormously from even this limited exposure. The accumulated months of training and consultation by Dr. Mária Hári and her staff at the Institute for Movement Therapy were an essential ingredient in the construction of the IMCP project. The consultation of Ester Cotton in London, England, was also extremely valuable. Finally, the three month sojourn of Margaret Parnwell gave the original staff daily contact with a consultant who had several years of first-hand experience with conductive education.

Several other consultants made substantial contributions to the project. Marylin Anderson, provided the staff with a patient, intellegent, sympathetic, and informed sounding board for the interpretation of its procedures thru the eyes of a physical therapist. Richard Dirks and Roger Stahl of the University of Wisconsin-Eau Claire audio visual department provided the project invaluable technical counsel in the use of its film and videotape equipment. Connie Burrill and Richard Halmstad performed outstandingly at the task of periodically evaluating the children - a statement supported by their very respectable test-retest reliabilities. Don T. Campbell must be credited with the suggestion to retest the field-test sample in order to get ECFAT growth norms, which could then be used to compare more appropriately the IMCP and Conventionally Trained children.

Rod Wolfe is credited with the design and drafting of the project's cover. Frank Wilson is credited with many helpful suggestions, especially with regard to documentation. Finally, David Nuesse, director of the University of Wisconsin-Eau Claire computer laboratory, is recognized for his thorough and well-organized program library and cordial facilitation of the project's statistical analyses.

Recognition is also due to the institutions who participated in the field testing of the project instruments and provided the "Conventionally Trained" subjects for the final experimental design. Judy Schust of Illinois Children's Hospital-School, Norma J. Johansen, principal of Crippled Children's School in Worthington, Minnesota, Gaylen Holmes, assistant director of the Crippled Children's Hospital and School, Grace Powers, principal of the Walter S. Christopher School in Chicago, Illinois, and Madeline G. Sheridan, princi-

pal of the Jane A. Neil Elementary School in Chicago, Illinois, are all recognized for their patient support of the project examiners and the devotion of their own resources to the assistance of the project.

The project is grateful to Leonard Haas, Richard E. Hibbard, John W. Morris, and especially Charles R. Bauer of the University of Wisconsin-Eau Claire administration, who gave the project their firmest support and most thoughtful counsel.

Appreciation is also due to the patience of A.C. Nelson, superintendent of Northern Wisconsin Colony and Training School, who supported the project despite its continual requests for exceptional treatment, and despite the awkwardness of being responsible for the health and safety of the project's children but not their training and therapy. The professionals in the Colony's therapeudic and ancillary departments were always cordial and generous in their consultation and assistance.

Finally, the project is especially grateful to the parents of the children both for their having reared such fine, affectionate, fun-loving children and for their willingness to enroll the children in the project despite its experimental nature.

Preface

The report that follows is organized into four volumes. Volume I is the report proper, including the relevant background literature and rationale for the project, the method of the intervention and the evaluation, the results of the study and the conclusions and recommendations based on the project's results and experiences.

Volume II is Appendix A, the detailed documentation of the project's procedures and their rationale. It should serve both to specify the intervention and to provide guidance for others who might want to develop series similar to those that were used by the project.

Volume III is Appendix B, a thorough report of the two instruments that were developed by the project staff to assess the progress of severely handicapped non-ambulatory cerebral palsied children. The Eau Claire Functional Abilities Test (ECFAT) includes eleven functional motor tasks. The Wolfe-Bluel Socialization Inventory includes 62 items which are organized into seven subscales of self care and social skills. The instruments are included along with the instructions for their administration, the procedures by which they were field tested, the results of the field testing, and the discussion of these results. These instruments had remarkably good characteristics, and should be of major value to professionals who are interested in the evaluation of severely handicapped children.

Finally, Volume IV presents an analysis of the evaluation data from the Institute for Movement Therapy in Budapest, Hungary. These data provide impressive documentation of the effectiveness for Conductive Education at that institute.

In addition to these four volumes, Judith Sorenson, with the assistance of the staff, has made a one-hour half-inch Sony videotape that tells the story of the project. This tape is available from the Audio-visual department at the University of Wisconsin-Eau Claire. Anyone wanting a copy should mail a blank 1000 foot one-half inch tape to the Audio Visual Department, University of Wisconsin-Eau Claire, Eau Claire, Wisconsin, along with $10.00 for handling.

This report climaxes the work of the IMCP project. The project was begun by Dr. James B. House in the fall of 1968 with support from the Chippewa Valley Chapter of United Cerebral Palsy, Inc. United States Office of Education support was sought and provided in the following year. During

the summer of 1970 Dr. House resigned from the project for personal reasons and was replaced by the current director.

Despite the replacement of the director and the large turnover of other staff during the brief history of the project, high staff morale was sustained for the duration of the project, and the intervention was maintained with unusual stability, consistency, and continuity. The tenacious dedication of the staff was instantly communicated to any replacements.

Nevertheless, the results of the project were quite disappointing. While the project children performed satisfactorilly on socialization and cognitive measures, their improvement on functional motor skills was, if anything, less than that of the Conventionally Trained children.

It is not clear what these results mean for the future of Conductive Education in the United States. It would probably be a mistake to assume that the IMCP project was a fair test of the procedures. The project was limited by staff turnovers, limited contact with other centers for Conductive Education, severity of children's handicaps, a stop-gap director, an incompatible setting, and a less-than-optimal evaluation design. Any one of these limits could invalidate the project as a test of conductive education.

The staff ended the project as they had begun - believing firmly that the principles and procedures of conductive education are sound and that the effort to import them to this country should be pursued. This belief and the documented success of the procedures in other settings must be seen as persuasive arguments for the continuation of this pursuit.

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I. Introductory Section

A. Summary

The Integrated Management of Cerebral Palsy (IMCP) project was designed to evaluate procedures based on the principles of conductive education, developed by András Pető and Mária Hári at the State Institute for the Conductive Education of the Motor Disabled in Budapest, Hungary. Conductive education involves training motorically disabled children in small, motivating groups of similarly handicapped peers to actively and voluntarily pursue those movements that are both incompatible with reflexes and functional in their self-care applications. The conductor programs the pursuit of these movements and facilitates the performance of the child so that he is continually challenged but always successful in his task.

After about two years of preliminary program development, the evaluation began with the selection of subjects in February of 1971. Preliminary evaluations were done in April of 1971 and subsequent evaluations in November, 1971, and April, 1972. The carefully integrated, 13½ hour-per-day program stressed the development of functional movement, socialization and academic skills. From two to four professionally trained teacher therapists worked with the children during all their waking hours. Institutional aides assisted with the "house-cleaning" and activities of daily living. One hour per day was devoted to exercises done in prone and supine positions; one hour to exercises in the sitting position; one hour to exercises that prepare for standing and walking; one-and-a-half hours to school; three hours to meals; one hour to juicing and pottying; one hour to dressing and undressing; and the remaining four hours to functional applications of learned movements in programmed recreation and in activities of daily living, such as hand washing, bathing, and grooming.

The program was conducted at Northern Wisconsin Colony and Training School in Chippewa Falls, Wisconsin. The Integrated Management (IMCP) children met four selection criteria: (a) having ages from 6 to 14, (b) having receptive language, (c) being non-ambulatory and (d) being admissible on a voluntary basis to Northern Wisconsin Colony (being Wisconsin residents, having a measured IQ under 70 and having the consent of their parents). The 15 Conventionally Trained (CT) subjects were selected from three cooperating residential orthopedic schools in the Midwest. To the extent possible, these children were matched with the IMCP children on mental and chronological age,

type of cerebral palsy, and speech and language characteristics.

The IMCP and CT children were compared on three basic dimensions of behavioral competence: functional movements, socialization, and cognitive functioning.

The results of periodic evaluation testing indicated that the CT children had higher initial scores on the functional movement variables and registered significantly greater gains on several of them. The IMCP children evidenced some regression on these measures. By contrast, on the socialization variables the IMCP children were comparable to the CT children on their initial scores and registered significantly greater gains on two of the seven measures. Finally, on cognitive measures the CT children had higher initial scores, but both groups made comparable gains.

The interpretation of these results stressed the role of the group in improving the socialization skills in the IMCP children. The performance of the IMCP children with regard to functional movements was disappointing. Supplementary analyses indicated that the greater gains of the CT children could not be attributed to their superior initial scores. Thus the IMCP intervention appeared to be less effective than the CT intervention as a therapy to improve functional motor skills. The school program was seen to be successful in that the achievement gains of the IMCP children were comparable to those of the CT children despite their poorer initial performance and the diminutive (1½ hours) IMCP daily school period. The discussion stressed the features that limited the validity of the project as an evaluation of conductive education: (a) a time table that made it difficult to establish an optimal program or an adequate plan for its evaluation, (b) frequent and costly staff turn-overs, (c) an incompatibility with the host institution, and (d) a less-than-optimal evaluation design.

B. Background

While it has only been recently introduced to Western Europe and the United States, conductive education has been developing for 25 years in the Institute for Movement Therapy (now called the State Institute for Conductive Education of the Motor Disabled) in Budapest, Hungary. The following is a concise statement of the procedural principles of the approach. A thorough statement of the adaptations used by the IMCP project appears in Appendix A.

1. Conductive Education is the active development of functional movements. The child participates and is motivated to achieve to the maximum through his own effort. This method contrasts with the approach of physical therapists, who attempt to develop motor skills with only the passive participation of the child.

2. Actively learned functional movements are applied in a real, not simulated circumstance. The child learns each daily living skill in the context of the actual time and place such a skill is required.

3. The motivation is intrinsic and not extrinsic. The child comes to find intrinsic reward in his increased competence. This contrasts with the extrinsic rewards that characterize most approaches to behavior modification.

4. Conductive Education stresses the facilitation of a movement that a child consciously intends to make. A facilitation consists of the least support from a conductor or external device that is required for successful completion of the movement. As the child's competence increases, the facilitory supports are removed until the child performs with no support at all. This contrasts with a behavior shaping approach, which starts the child with no instruction as to his goal and then rewards him with candy or some external prop until the desired movement becomes easily made.

5. Progress is seen as individualistic and not developmental. The elimination of facilitory supports is ordered uniquely for each child and is not programmed according to any pre-conceived, universal developmental system. The conductor's task is to drop every support whose elimination does not threaten the integrity of

the movement involved, requiring the child perform the movement to the limit of his capacity.

6. The administration of the program is integrated and not segmented. A single conductor meets the needs customarily met by the physical therapists, occupational therapists, speech therapists, teachers, friends, and maternal figure. Thus, it is possible to interrelate parts of the day into a total, purposeful experience for the child.

7. The context of learning is a social group interaction as opposed to a client-therapist session. Group participation, integrated program administration, and emphasis on intrinsic motivation all work to improve the children's social and motor competence simultaneously and promote emotional growth.

As an innovation in the United States, the integrated approach is perhaps best seen as a unique re-combination of various educational approaches that stress voluntary control of movements. Fay (1948) and Phelps (1940, 1941) appear to have been the forerunners of this approach, and their lead has been followed and modified by such workers as the Bobaths (1952, 1954, 1963, 1964), Kabat (1958, 1952), Knott and Voss (1956 and Kabat 1950, 1952), Rood (1950, 1956) Meierhenry (1969) and Phelps (1940). A critically less credible approach along these lines has also been promoted by Doman and Delacato (1963).

When asked to perform a movement, the cerebral palsied child typically responds with an abnormal, stereotyped pattern, based on the primitive reflexes found in a normal baby. Exercises approached in this way tend to reinforce poor movement patterns, presenting major difficulty in treating the cerebral palsied child. In order to counter these reflexes, many of the above authorities have developed methods of habilitation aimed toward production of normal, active voluntary movements, which are achieved by facilitation after inhibitory measures have produced more normal muscle tone. Success of the treatment is dependent upon the "skilled handling of the patient by the therapist." Principles of treatment are described by the Bobaths (1964, p. 1) as follows:

1. Inhibition of abnormal postural reflex activity to reduce hypertonus in the spastic and many athetoid patients.

2. Facilitation of potentially normal postural and movement patterns on the basis of a more normal muscle tone, in order to maintain and secure normal tone qualities obtained by inhibition.

3. Increase of postural reflex tone and regulation of reciprocal muscle function.

As conceived of by Petö, however, the method of "rhythmical intention" enables a child to perform active movement unaided by a therapist, without using his abnormal motor patterns. Movements are controlled by the cortex while guided by the child's own speech.

None of the foregoing approaches, however, attempts as Petö has, to integrate the treatment of the cerebrally palsied child into the hands of a single specialist; none of them provides for a group treatment; all of them stress a comparatively passive physical approach where the manipulatory skill of the therapist is stressed. The Petö approach to the management of cerebral palsy and certain other neuro-motor disorders is unique in that it takes an unconventional approach on all three of these points: the treatment is integrated under the direction of one type of therapist, it is accomplished within a group structure providing increased motivation, and the therapy is entirely active in nature in that the child is expected to perform all desired movements himself rather than being manipulated by a therapist.

Theoretical and Empirical Background

There appears to be no solid theoretical background to support the initial establishment of conductive education; rather, it appears to have been an outgrowth of ideas held by András Petö during his career as a physician, neurologist and educator in Austria and Hungary. While the integrated management approach has been used for over 25 years at his Institute for Movement Therapy in Budapest, Hungary, very little has been published by Dr. Petö himself prior to his death in 1967. However, several observers of the program have described it in some detail, and Dr. Mária Hári, the current director of the Institute, in collaboration with Dr. Károly Ákos, has recently published a book in Hungarian on the procedures. (Both authors were close associates of Petö and active in the development of the Institute.) This book presents the theory of conductive education as it is implemented in the Institute. Its first chapter is dedicated to a summary of the Institute's admission, discharge and follow-up evaluation data. Statistical analyses of these data are presented in Appendix C (Volume IV) of this report.

Integration of Treatment

In an attempt to form a possible theoretical basis for conductive education, as Peto might have conceived of it, the present paper will continue to examine the literature concerning various aspects of the approach. For example,

there is myriad of material published which supports use of the holistic approach in both treatment and education of the cerebral palsied child.

Keats (1965), Cardwell (1956), and Raus (reported by Keats, 1965), Allen (1960), Johnson (reported by Cruickshank, 1966), Egland (1966), all agreed that consideration of all interrelated aspects of the cerebral palsied child during habilitation is tantamount. Cardwell (1956, p. 122) expressed the idea in the following manner: "The human organism is a dynamic, interacting, integrated whole; therefore treatment must be equally dynamic and fluid to keep pace with the changing, evolving person and must consider all that person's needs." She summarized by saying, "In a program of care for the cerebral palsied, the emphasis is inevitably on total habilitation of the whole child, not on the physical, vocational, or any other special aspect of his problem. To concentrate on any one aspect while ignoring others denies the wholeness of the individual, and the necessarily inclusive nature of rehabilitation itself." Cardwell's statement seems to coincide with that of Cotton (1965, p. 1) describing Petŏ's outstanding contribution as the "conception of the need for the unity of approach to the treatment, education and management of the cerebral palsied child."

Parnwell (1968, p. 2,3,4) aptly characterized what she feels are the disadvantages of using the segmented therapy approach with the multiply handicapped cerebral palsied child, in favor of the holistic approach:

"We are taking acutely damaged, confused, fearful and distracted children, and fitting them into a regime that subjects them to endless changes in environment, personality and attitude... It would need a miracle to maintain consistency of approach throughout even in the learning of one skill: success is unlikely by this method... We cannot continue to employ modern factory belt techniques of perfecting one part of a child in isolation from the other parts, and then expect all parts to fit together to make an educated and functional human being."

In support of the holistic approach Cotton and Parnwell (1967, p. 1) described conductive education in the following manner: "(it) unites treatment and education, treating all symptoms of cerebral palsy together by putting the child in a favorable learning situation under the guidance of one teacher-therapist. The training,which is intense and repetitive, aims at establishing the normal active (voluntary) motor patterns necessary for normal function and activity. It is not a substitute for normal education,but a preparation for school and life." Parnwell (1968, p. 5)

described the most valuable teaching aspect of the conductor's role as her "ability to integrate all areas of learning, to be aware of all small achievements, using them throughout the day in different situations, so that the learning is constantly reinforced and increased in relevance."

Treatment in Groups

Another important aspect of conductive education indicated by Cotton (1965, 1970), Cotton and Parnwell (1967), Parnwell (1968), Klein (1962), and Eckhardt (1964) in their reports of study trips to the institute in Budapest, is the treatment of cerebral palsied children in groups rather than individually. According to the literature available, this aspect seems quite unique. Aside from information regarding educational training available to the less severely involved child attending an orthopedic day school, there is a minimal amount of published material alluding to the group treatment of the cerebral palsied.

Keats (1965) projected the idea that the general retardation factor in cerebral palsied children may be due to lack of association and communication with other children of a similar age -- the so-called "retardation by deprivation." He concluded that improvement in many areas of learning would progress more rapidly with socialization of the children in peer groups.

After observing the program of therapy, education and recreation, over a period of years, at the Westerlea School for Spastic Children (London, England), Nathams (1968) concluded that with group work, guided by staff members, the children seemed to progress more rapidly than they had in individualized therapy in all three areas of rehabilitation.

In a ten-week project involving the rehabilitation of 15 hemiplegic patients, five were treated individually and ten were treated as a group. The group subjects achieved their maximum goal eight days ahead of the individually treated subjects, demonstrating the advantages of group rehabilitation with hemiplegics (Kurasik, 1967).

Barrett (1967) found improvements in social, verbal and motor behavior after ten cerebral palsied children were involved in a group experience in a small confined space over a 4½ month period. The children were in daily attendance at a pre-nursery school. All were severely involved hemiplegics or diplegics having "borderline" to "average" intelligence. Behavior was recorded and charted descriptively on a "movement evaluation scale" which was specifically devised for use in this study. The observation periods averaged 45 minutes for

each of nine sessions. Results showed that aggressiveness or fearfulness of some children caused problems initially, but that notable improvements were evidenced in all but one or two. Statistical analyses indicated a significant increase in verbal response within the group. All were integrated into group participation, the hypo-active being stimulated and the hyperactive being calmed by the group.

After observing the total program at the Institute for Movement Therapy, Parnwell (1968) described advantages of group work within conductive education in the following: "The children are motivated towards effort and achievement by their participation in the life and work of the group. Initially isolated by his immobility, lack of communication and emotional fears, each child slowly emerges and becomes as active part of the social structure. He becomes aware of himself as a social creature, he becomes interested and concerned in the progress of the group, and his personality and confidence begin to develop. Initiative and competitive spirit grow as a direct result of the interaction that goes on in a closely associated group of children."

Rhythmic Intention.

Reportedly, when Petö was pressed for a theoretical explanation for the success of his treatment, he would refer to the research of the Soviet psychologist, A.R. Luria. In particular the principle of rhythmic intention, which is central to conductive education, appears to have one-to-one correspondence to the method of speech reinforcement, which has been studied extensively in Luria's laboratory. Upon further investigation, it appears that conductive education is based on an understanding of the neurophysiology of Vygotski, Sechenov, and Pavlov, in addition to Luria (1961,1966), all of whom describe the connections between speech and active movements. In an early study, Vygotski (1929) observed that a four or five-year-old child who was having difficulty completing a motor task often engaged in vocalizations that were "obviously related to the situations which were causing the difficulty." At first, the child's speech was a reflection or copy of the situation causing the difficulty; later verbalizations became more generalized reproductions of those associations of previous experiences which enabled him to work his way out of these difficulties.

According to Pavlov (1928, 1937) the cortex must be free of all other activities when new pathways (connections) from the brain to the musculature are being formed. A new movement pattern presumably is developed by a conditioned reflex which is reinforced by a modification in the"second signalling system" (the system of verbal elaboration by which self-regulation of behavior is made possible). He explained the

importance of the existing interaction between movement and speech, illustrating the reciprocal facilitation of speech and movement; their use together improves the quality of both. Emphasized also, is the necessity of "concentration and repetition" in forming these connections or "conditioned reflexes"as Pavlov calls them. Pavlov's theory seems to support the aspect of conductive education termed "rhythmical intention," in that the speech is assumed to aid in concentration on the task at hand, to the exclusion of all other activity.

A subsequent examination of Luria's theories of neuropsychological integration, as supported by his own research, also offers support for the idea of integrating speech and language with the teaching of motor tasks. Luria has experimentally demonstrated the interdependence of speech, language and motor skill development. In one study (Luria, 1961), described a small child who was unable to squeeze a rubber ball twice in regular sequence in response to a single verbal command issued by the experimenter. However, when the child was asked to repeat "go-go," thus reinforcing the action with speech, he was able to complete the task without difficulty. Luria also demonstrated that infants between twelve and twenty-four months can learn a motor task and a linguistic task more rapidly when the two are associated in time and effort than when they are taught separately.

Miller, Shelton and Flavell (1970) replicated Luria's study of 1961, finding little or no evidence that the vocalizations served a directive function over the manual responses. According to Birch (1971, p. 25) however, Miller, et. al. reported in the details of their results, the observation that the children in their study "tended to perform the vocal and manual responses at very nearly the same time (i.e., generally within 100-250 msec. of each other.") Birch found these results to be compatible with those of Luria and also with the findings of his own study (see Birch, 1971).

In 1968, West replicated two of the Russian studies showing relationship between speech and movement. Results of the first experiment, patterned after the electromygraphic studies of Novikova and Bassin, showed agreement among all three experimenters. They found that latent movements of the speech apparatus appeared in an adult male each time he performed an action associated with the solution of a given task and particularly if he encountered difficulty. The investigators concluded that these latent movements had previously been the external speech which gradually became less detailed and shortened, finally to become internal speech which continued to participate in the solution of all complex tasks.

Findings from West's second study also concurred with those of the previous experimenters, Peskovakaya and Tikhomirov. Results verified that "well-controlled verbal reactions which are clearly timed to a specific signal, become the basis for a stable functional system in which each motor response is made under the influence of the subject's verbal impulse." West went on to explain that "under the influence of such additional afferent impulses, which now come from the child's verbal reaction, the correct motor reactions to the signal are reinforced, and the subject's motor reactions enter into the system with their own verbal reactions," (West, 1968, p. 287).

In addition to the research cited above, Ivanov-Smolenski (reported in West, 1968) concluded from his recent experiments that it is possible to induce a certain concentration of the nervous processes for the purpose of the development of motor reactions using contiguous verbalization. He stated that it is then possible to preserve a motor response after the constant verbal reinforcement has been eliminated. If Ivanov's conclusions are correct, then rhythmic intention not only promotes the development of the motor response but also maximizes the subsequent carry-over of motor activity to its functional application after removal of the verbal reinforcement.

Requiring verbalization of the child contiguous with his movements is one manifestation of a basic principle in conductive education, namely that treatment of the cerebral palsied child should be "essentially a matter of training the patient in developing voluntary control of his musculature" (Pohl, reported by Keats, 1965, p. 65).

In his systematic observations at the Institute in Budapest, Klein (1962) noted that conductive education "does not stress the passive exercising of individual muscles or joints, but rather, active movements of the whole body." Klein analyzes the exercises as if they were means of carrying out "functions of the cortex, which controls motor-sensory capacity. The activeness and repetitiveness of the exercises eases the task of overcoming motor disorders. The "dynamic stereotype becomes increasingly orthmotor functioning." (p. 7).

Cotton (1965) has reported on her observations at the Pető Institute and has described the program in considerable detail. She compared this approach with conventional neurodevelopmental treatment methods with which she had been associated for two decades, stating that the success of the neurodevelopmental, or neuro-physiological approaches depended upon the "skilled handling of the patient by the therapist."

The Petö approach, on the other hand, "makes it possible for the child, unaided by the therapist, to perform active movement without using his abnormal [(reflex)] motor patterns."

Other Centers for Integrated Management.

Several centers have been established for the integrated treatment of cerebral palsy outside of Budapest, Hungary. Two day programs, Lady Zia Wernher Centre for Spastic Children in Luton, England, and the Claremont School for Spastics in Bristol, England, were established in 1966. The first residential group following Petö's principles is in progress at Craig-Y-Parc, South Wales, and a more recent day program is being carried on at the Centre for Spastic Children, Cheyne Walk, England (Cotton, 1970). There is, reportedly, an institution in Prague, Czeckoslovakia, that has a program patterned after the Petö approach, but no reports have been published about it.

Cotton and Parnwell (1967) have reported on their experimental application (modified) of the Petö approach with severely athetoid children in Luton, England. They describe in detail the pre-writing program pointing out that other programs and sequences used are designed in a similar manner to the one described. The abilities needed for writing are sub-divided into eight parts - sitting ability, head control, independent eye fixation, body symmetry, control of hands and forearms, independent hand control, pencil control, and spatial body perception - as the pre-writing and writing skills to be learned before the goal of writing can be achieved. These prerequisites are further analyzed into sequential tasks that are practiced every day by the children in the group sessions, first lying on their cots and then sitting. When transfer is made to an actual writing situation, the foregoing skills mirror parallel activities in the writing task itself. For instance, while operating in a free-sitting situation, the child stretches his arms out to the sides and then touches his hands together in the middle, which parallels in the writing lesson the making of two dots at the sides of the paper and two dots in the middle. Thus, the task is broken up into smaller movements which, when accomplished optimally, are subsequently put together to form the complete, continuous movements required for the writing task. The above article is an invaluable guide to the understanding of the principle of conductive education, using one facet of the child's learning.

Conclusion.

The foregoing report indicates that the logic and apparent success of conductive education has stimulated considerable international interest. However, as is often the case when

the need for innovation is critical, the advocates have neglected a systematic evaluation of the project. In the words of psychologists Gardner and Price (Cotton and Parnwell, 1967, p. 11),"there is no doubt that the Petŏ method, especially in the application to severely handicapped children for whom little positive treatment is available -- deserves exhaustive study. . . " Such a study is the objective of the current proposal.

C. Project Objectives

The objectives of the program were complex and existed in many domains. In some cases it was easy to determine empirically whether or not objectives had been met; in others it was more difficult. The major objective is implied by the project's title - it was a project to evaluate the integrated management procedures for treating the cerebral palsied. All other objectives were ancillary to this one. Specifically enumerated, these ancillary objectives were:

to implement a program using integrated management procedures that replicate as nearly as possible those used at the Institute for Movement Therapy in Budapest, Hungary,

to compare the motor, social and educational progress of the children who were trained with the integrated management procedures with similar children who were trained with more conventional programs,

to develop objective instruments for the comparisons listed above,

to develop a training program for both professionals and paraprofessionals,

to generate hypotheses for new research.

Implementing an Integrated Management Program.

While the procedures used in the Institute for Movement Therapy have been generally described, (Cotton, 1965), their thorough documentation has never been attempted. One of the objectives of the IMCP project was to develop such documentation.

Furthermore, even extensive documentation of procedures is a sterile communication without a model program to observe. Therefore, one goal of the IMCP project was to provide an exemplar, based on the Institute for Movement Therapy, that is accessible to Westerners.

Comparing IMCP-Trained Children With Conventionally-Trained Children.

The following passage appeared in the Addendum to the original proposal, dated September 29, 1970.

"Goals for the experimental and control subject populations will be defined in terms of the following categories: motor skills, communicative skills, social development and academic achievement.

Motor achievements will be sought and measured in the following areas: mat skills, sitting, pulling to a standing position and maintaining it, sitting down from a stand, walking, fine motor skills, writing, dressing, eating, and drinking. The goal for each of these functions will be the independent achievement of each of these factors within acceptable limits of functional behavior.

Communicatively, the goals for the subject population will be in the areas of receptive language and general communicative skills including speaking, listening, reading and writing. The goal in language development will be to achieve receptive and expressive language development scores that somewhat approximate the chronological age.

The program aims to improve socialization skills in the subject population commensurate with those of a similar age group. Specific items of measurement are, as in the other goals mentioned, listed in the appendix with the instrument designed to evaluate these capabilities. Generally, we are interested in the child's increased ability to interact acceptably with all social forces in his environment.

Educational goals are defined, for purposes of this study, in terms of general educational achievement at primary and elementary levels. Such achievement would include such categories as common observation, aesthetic differentiation, size discrimination, object association, spatial awareness, vocabulary, number sequencing, analogies, arithmetic reasoning, logical selection and opposites, as well as pre-reading and reading skills. The goals in this category would be for the children in the experimental group to have progressed at an expected rate of educational advancement over a two-year period."

While these goals have remained intact, comments are in order. First, these goals are stated, for the most part, in global, non-operational language. In fact, however, they relate directly to the evaluation instruments, so that functional movement goals are evaluated using the Eau Claire Functional Abilities Test; communication goals are assessed by the Peabody Picture Vocabulary Test and the Mecham Verbal Language Scale; socialization skills are assessed by the Wolfe-Bluel Socialization

Inventory; and educational goals are assessed by the Peabody Individual Achievement Test. (See Section I-E)

Second, it was misleading to state the objectives in terms of absolutes, (e.g., "developmental scores that somewhat approximate the chronological age"; "progressed at an expected rate of educational advancement over a two-year period"). The absolute goals were, in fact, indeterminate. Furthermore, a priori limits on a child's progress are specifically excluded by the philosophy of conductive education. Thus, the goals for the children must be put relatively: it was expected that the experimental children would gain more than their matched controls in all evaluation areas.

Developing Objective Instruments for the Evaluating of Functional Movements, Socialization and Self- Care Skills.

A thorough search of the measurement instrument literature revealed no acceptable instruments for the assessment of functional movement or of socialization and self-care skills for low-functioning children. One of the objectives of the IMCP project was to develop and standardize the instruments necessary to make these evaluations.

Developing a Model Training Program.

It seems almost axiomatic that the evaluation of any social or education program should be accompanied by provision for its dissemination. (An expensive evaluation of this sort should not, of course, be undertaken in the first place unless there is reasonable a priori assurance that it will lead to reform.) Therefore, one of the goals of the IMCP project was to develop a model for training professionals and paraprofessionals in the IMCP procedures.

Generating Hypotheses for Additional Research.

While the IMCP project was committed to replicating the Institute of Movement Therapy's procedures as nearly as possible for the current evaluation, any future projects that continue the integrated management procedures will not be so bound. Thus, the staff will search continually for potential improvements that could form the basis for future research.

D. Method (Intervention)

This section describes the subject populations and programs that characterized the IMCP project and the Conventional Training (CT) programs with which it was compared. Because the IMCP program is documented extensively in the IMCP Documentation Handbook (Appendix A), only an overview of its intervention procedures is presented here. The description of the intervention equipment is deferred entirely to the Handbook.

Subjects

The 10 IMCP children were housed at Northern Wisconsin Colony and Training School in Chippewa Falls, Wisconsin. The 15 Conventionally Trained (CT) children came from three residential centers for the orthopedically handicapped in the Midwest: Illinois Children's Hospital-School in Chicago, Illinois, (n=4), Crippled Children's Hospital and School in Souix Falls, South Dakota (n=3), and Worthington Crippled Children's School in Worthington, Minnesota (n=8). Five of the IMCP children and ten of the CT children were boys. In February, 1971, the mean age of the IMCP children was 9.29 years and the unbiased standard deviation was 2.48. The corresponding values for age of the CT children were 9.24 and 2.10.

The IMCP children were all those who met four criteria. They were (a) non-ambulatory, (b) between the ages of five and thirteen, (c) able to understand simple instructions, and (d) admissible to Northern Wisconsin Colony (admission requirements are a measured IQ under 70, permission of parents and Wisconsin residency.) Only one of these children had resided at Northern Wisconsin Colony prior to his enrollment in the project. Two others were transferred from Central Wisconsin Colony and Training School in Madison, Wisconsin. Three more had been living at home and attending day care programs. Finally, four had been in orthopedic schools. Two of these had had five-day-per-week foster placement and two had lived at home.

The 15 Conventionally Trained subjects were matched to the extent possible with the IMCP subjects on their (a) description of cerebral palsy involvement, e.g., athetoid quadriplegia, spastic quadriplegia, mixed spastic athetoid, etc.; (b) chronological age, (c) mental age, (d) motor ability in lying, sitting and "walking" positions, (e) hand skills, (f) dressing abilities and (g) speech characteristics.

An Overview of the IMCP Program

After two years of pilot programming, the project began its documented program (see Appendix A) in February,

1971, and continued thru April, 1972. The program was an intensive total therapy that was staffed by degree-holding teacher therapists and competent institutional aides. The teacher therapists got the children out of bed at 6:00 a.m. and spent the next 13½ hours in direct contact with them administering a program that was integrated to maximize the interwoven reinforcement of the various activities that occurred during the day. A detailed description of a typical day follows.

Rising and pre-breakfast activities (3/4 hour)

Breakfast (1¼ hours), pottying and dressing for day. (½ hour).

Throughout the period emphasis is on the application of learned movements to daily living skills such as face and hand washing, hair brushing, eating, drinking, and toothbrushing. Children are encouraged to exercise as much independence as possible in performing these activities. Before and after breakfast, changing of clothes is carried out on the plinths in a lying position.

Plinth Series (tasks carried out in a lying position) (1 hour).

This is a group activity concerned with the learning and improvement of gross motor skills. Children begin in a supine position and proceed through a number of changes of place and position as dictated by the statements of the task by the teacher therapists. The tasks are chosen to improve such things as body symmetry, grasp and release, targeting, rolling, range of motion and perception, particularly perception of body image. The Plinth Series and the active movements involved prepare the child for the applications (e.g., eating, washing, dressing) which follow throughout the day. The last task of the Plinth Series (sliding off in prone) brings the children to the ends of the plinths with their feet touching the floor.

Standing, pottying and moving to table (¼ hour).

The children, as a group, repeat a number of intentions designed to help them assume a proper standing position. Each child stands grasping the slatted plinth before lowering himself to a potty, stands up from the potty and moves (by walking behind a chair) or is moved in his chair to the table. These functional changes of position afford an opportunity for the application of those gross motor skills learned during the Plinth Series.

Morning break - juice (¼ hour).

The group again applies learned skills to drinking. Large double-handled cups are used and the children are encouraged to be as independent as possible in grasping the cup, moving it to and from the mouth with elbows fixed on the table, and releasing it. Regardless of the amount of independent functioning for any given child, drinking is stressed as a bilateral function.

Hand Class (1 hour).

The group activity concentrates on improving the ability to use the hands and arms while maintaining an upright sitting position. The skills learned include grasp and release, vertical and horizontal movements of the arms as well as proper hip, upper trunk and foot position for sitting. The tasks stressed are primarily designed to be applied in hand washing and eating, which follow during the lunch period.

Handwashing and Lunch (1 hour).

For lunch, as for breakfast, practical application is made by the children of those motor skills learned and perfected during the formal activities. With increased staff at this time, additional assistance and direction is available for those children who are able to feed themselves.

Rest Period (1 hour).

The early-shift staff are replaced by the late-shift staff. They exchange information while the children either rest on the plinths, play quietly or go outdoors. Some hotpacking of joints is done in preparation for the next activity.

Standing and Walking (1 hour).

The group is subdivided into three subgroups according to level of ability; thus tasks are individualized. Those children capable of some independent stepping devote time to improving that skill and comprise one subgroup. A second subgroup consists of those children capable of sitting independently with support. Attention is devoted to rising independently from a sit, weightbearing, and sitting down from a stand. In a third subgroup which consists of children who are capable of sitting independently only at a table, the tasks are designed to promote stable sitting while

grasping a support to prepare for standing up. At the termination of this activity, the children move to the tables in the most suitable way possible and prepare for the second drink break.

School (1½ hours).

The group meets together part of the week (usually one day) and divides the other part (usually four days) into two groups termed "pre-primary" and "primary." This division is essentially on the basis of observed intellectual capability. The pre-primary group concerns itself with simple number concepts, some word recognition, vocabulary growth (both receptive and expressive) and an increase in general environmental awareness. Learned hand skills are applied in making responses and in participation in general school activities, such as painting, paper folding, etc. The primary group emphasizes pre-reading skills, simple mathematics and general language improvement. Hand skills are applied in making responses. When the two groups meet together, the children are exposed to a more general program designed to build sensory and tactile awareness, to increase knowledge of the environment and to promote greater manual dexterity. Much attention is given to vocabulary building and receptive language improvement. This group contributes to the planning and preparation of such outside activities as picnics, parades and trips to the zoo in which they will then participate. Throughout school, a good sitting position is stressed by the teacher-therapist.

Dinner and Bedtime Activities (2-2½ hours).

After handwashing and eating, the children potty and return to the plinths to undress and don pajamas. Dinner is carried out much the same as the other two meals with the addition of three bath nights per week during which the children are encouraged to attempt self-washing. After the children are in their pajamas, the TV might be turned on, a story might be read, or tutoring in school, for example, might be done. A final pottying occurs before lights are turned off for the night.

Overview of "Conventional Training" Programs

The "Conventionally Trained" children were sampled from three Orthopedic Schools in the Midwest: Illinois Children's Hospital-School, in Chicago, Illinois; Crippled Children's Hospital and School in Souix Falls, South Dakota; and Worthington Crippled Children's School in Worthington, Minnesota.

Exerpts from the literature that these institutions have published about themselves are printed below. These exerpts make it clear that each of these programs involves an intensive program of therapy and education administered by a sound professional staff.

Illinois Children's Hospital-School

Illinois Children's Hospital-School, is a residential institution for severely orthopedically handicapped children. It is operated by the Department of Children and Family Services of the State of Illinois, and has a capacity of 100 resident students. The Hospital-School is an Educational and Rehabilitation center, rather than a fully staffed and equipped hospital. Yet, the Medical Program, within the institution, is quite diversified, and the location in the Chicago Medical Center, puts highly sophisticated and specialized resources at the fingertips of the Resident Medical Staff.

Hospital-School students, about two-thirds of whom are in the elementary school program, and one-third in high school, attend classes within the institution every weekday except during holiday recesses and summer vacation (unless they attend summer school). The program is approved by the Office of the Superintendent of Public Instruction as meeting standards for all public schools in the state.

There are unique differences in the Hospital-School Program. Classes are much smaller than in the regular school, averaging seven to nine students per class. The programs are non-grade i.e., the student is not required to complete courses during a stipulated period of time. Instead, he works at his own pace to master the course content. Allowances are made for difficulty he may have in reading or writing because of his disability. He may require a great deal of

special attention from the teacher, or help from a volunteer classroom assistant.

While adjustments are made in the form of a child's schooling, there is no relaxation of standards for his intellectual achievement. The Hospital-School, readies the student for life after graduation, by applying the same academic goals as those established for non-handicapped children. The high school program has two tracks, one geared to the needs of the child capable of attending college, and the other stressing pre-vocational training and self-help skills which will enable the student to live independently after graduation, or with a lesser amount of assistance from his parents, relatives and associates.

The teaching staff includes 15 full-time instructors who are supervised by an Educational Director. All teachers have training in Special Education, many have Master's Degrees, and all have had some graduate training. Besides serving as a practice-teaching resource for Education students from Northern Illinois University and Illinois State University, the Hospital-School employs consultants in the fields of Music, Art and Vocational Education, to augment the work of its regular teachers.

Full-time supervision by licensed physicians is given to all medically-oriented services, but the day to day rehabilitation work is carried out mainly by Physical and Occupational Therapists, Registered Nurses, and a Dietitian. Braces, Prostheses and other appliances are prescribed and changed as needed for maximum assistance to, and development of, each child.

About 100 women, men and teen-agers volunteer to serve as classroom assistants, tutors, field trip and clinic escorts, mealtime helpers, social service aides, and in a variety of other capacities. They lend assistance to the rehabilitation program, converse with the youngsters about places they have been and about worthwhile experiences in store for the youngsters outside the institution.

A complete Physical Education-Recreation Pro-

gram is offered to all students allowing each student to participate at his physical ability level. Students are as active in this program as the Medical Rehabilitation Staff will allow. Some of the activities are -- Basketball, Field Hockey, Softball, Badminton, Football, Bowling, Pool, Checkers, Chess and Shuffelboard.

Crippled Children's Hospital and School

In March of 1952 the first children were admitted to the Crippled Children's Hospital and School, Sioux Falls, South Dakota, for education and treatment. Additional dormitory, therapy, educational and recreational facilities were added in a building program completed in January of 1958.

The Rehabilitation Center is licensed to accommodate 64 boarding and 40 day student-patients.

The Crippled Children's Hospital and School is a non-profit corporation owned by contributors. Monies for operation come from voluntary donations, bequests and memorials, educational fees from the School District in which the child resides and from the State Department of Public Instruction and parent fees.

Approximately 100 staff members assist in the rehabilitation program at C.C.H.S. Presently there are thirteen teachers, five physical therapists, four occupational therapists, five speech therapists, one social worker, one psychologist and five registered nurses on the staff, in addition to auxiliary personnel.

Housemothers, dorm counselors, maintenance men, cooks, clerical staff and all employees (in addition to therapists, teachers and nurses) are considered part of the rehabilitation team. Through identification with staff members, the children are aided in acquiring appropriate social roles. The staff members have a direct influence on motivation in therapy and education, moral values, acceptance of disability and the establishment of realistic goals.

Education is provided at the Crippled Children's

Hospital and School from pre-school through high school. The classes and curriculum are similar to those found in the public schools. Pupils are placed in graded classes according to their previous school records. They are normally promoted a grade each year, although loss of time caused by illness or surgery may delay progress.

Class size is normally limited to 14 students to provide for more individualized instruction and to allow the teacher time for helping the pupils with their physical needs. Special equipment in the classroom may include electric typewriters, desk hearing aids, beds, book holders and other equipment to facilitate the mechanics of education.

The elementary program parallels that of the public school and children are able to transfer in or out with very little difficulty.

In addition to the required courses the high school offers a full commercial program since secretarial or clerical work is often a possible vocation for physically disabled persons. Students may also take electives on an individual basis or by programmed instruction.

A correlated program of music, art and social studies provides for the social and cultural development of the student in the areas of learning dealing with human relationships and creative expression.

The physical rehabilitation area of the program at C.C.H.S. makes a definite effort to coordinate the therapy program with the other departments of the center. No one area of the program is proportionately more important than another. Patients are scheduled for treatment periods of varying lengths of time, and as often as necessary. At no time are children scheduled for group therapy, except in speech; rather, each child is seen individually for his particular needs. The program includes occupational, physical and speech therapies all of which are structured to the particular disabled child.

Students spend two hours a week in the gymnasium activities, two hours in swimming instruction, and one hour in health education class.

Even the most severely disabled participate in games and sports.

Worthington Crippled Children's School

The Worthington Public Schools operate a unique facility in the Worthington Crippled Children's School. WCCS is the only public tax supported residential school for neuro-orthopedically handicapped students in the state of Minnesota. It has residential space for 51 and classroom space for about a dozen day students.

As the only such residential institution in Minnesota, the Worthington School handles children with many types and degrees of handicaps. Often a student may show little physical evidence of being handicapped. Some may suffer from cerebral palsy and deafness or cerebral palsy and limited vision. Other students cannot speak but are able to learn to read and communicate with the help of electric typewriters and wordboards. Each student presents unique learning problems.

The school operates on a regular nine month school term, and all school holidays and vacations are observed. The focus of the program is on the education of the students in academic and vocational areas. The program also has speech therapy, occupational therapy, and physical therapy all of which are structured to overcome learning limitations. This is not primarily a clinical facility but rather an educational facility. Clinical, hospital-like, remediation is provided only in such a way as to maintain and develop those abilities necessary to foster the ability to learn.

The school offers a wholistic learning experience for the handicapped student. In classes, the student progresses to the best of his ability under teachers who are specially trained in teaching handicapped children and assisted by teachers' aides. Occupational, physical, and speech therapies help each youngster cope with his handicaps. A social worker coordinates the school activities with the student's home life and helps to create mutual understandings. The residential staff includes a supervisor of residence, child care workers, cooks and custodians who see to the student's needs

outside the classroom.

Each classroom has about ten students per teacher and the students are divided into primary, intermediate, or upper classes. Since many of the students are multiply handicapped (including some blind and deaf students), individual programs are worked out for them, including time for occupational, physical and speech therapies.

The residential program, under the direction of a supervisor of residence provides a group living experience for the students during the times they are not in school, including their only outside experience, a Saturday swimming program at the Y.M.C.A.

E. Method (Evaluation)

This section describes the methods used to evaluate the project and compare its results with those of the Conventional Training programs.

Selection of Subjects and Experimental Design

Subjects are described in Section I-D above. The original design had called for the matching of pairs on the characteristics described in that section. One member of each pair was to be randomly selected for the IMCP program and the other tested periodically but otherwise left to whatever programming was available to him. Limited numbers of available children precluded the exercise of this plan. "Matched" pairs were then selected for the ten IMCP children from the three cooperating institutions described above. In addition, five extra comparison subjects were selected in order to fill in for any who might be lost for one reason or another. However, pretest analyses indicated (a) that the "matched" pairs did not perform comparably on the criterion instruments and (b) that the CT children were superior to the IMCP children on several Eau Claire Functional Abilities Test subtests and the IMCP children were superior to the CT children on two of the Wolfe-Bluel Socialization Inventory subtests (see Evaluation Instruments below). The decision was made to use all the subjects and use repeated measures and statistical control to compensate for this mismatching.

Because the original design called for repeated measurements, making the gain score the variable of analysis, the necessity to use mismatched intact groups was less crucial than it would have been for a posttest-only evaluation plan. However, there remained the possibility that the subjects with higher (or lower) initial scores might have more potential for growth, so that differential group gains might be due to initial differences rather than to any effect of interventions per se.

This possibility prompted the use of a procedure to adjust scores statistically for any gains that could be attributed solely to subjects' age and pretest scores. This statistical procedure is presented in Section II-D (Analyses of ECFAT Posttest Scores That Were Adjusted for Pretest and Age) below. The rationale for this procedure is discussed in Section III-C (Rationale for the Experimental Design).

Evaluation Instruments

It was noted in Section I-C that no satisfactory instruments were found to assess functional movements or socialization and self-care skills of severely handicapped cerebral paslied

children. For this reason, the project staff developed the Eau Claire Functional Abilities Test (ECFAT) and the Wolfe-Bluel Socialization Inventory (WBSI). Appendix B presents these instruments along with the procedures and results of their field testing.

The ECFAT was used to measure periodic changes in motor behavior. This instrument is a series of 11 items that parallel the project's goals for motor behavior: Mat Tasks, Free Sitting, Standing Up, Sitting Down, Walking, Eating, Chewing, Drinking, Hand Skills, Writing and Dressing. Each item has nine levels of competence. It is administered by an examiner who has been trained to recognize degrees of functional independence in these areas. The field testing of 51 children in three orthopedic schools produced an inter-rater reliability of .997 for the total ECFAT score. The retesting of 45 of these subjects 16 months later produced a test-retest reliability of .958. Reliabilities of individual items are presented in Table 1 and Appendix B.

The WBSI was used to measure periodic changes in social and self-help skills. This instrument contains 62 items in seven subscales: Self Care, Environmental Orientation, Independence, Communication, Emotional Maturity, Group Interaction, and Intellectual Growth.

Each item of the WBSI specifies a behavior that may or may not characterize the subject being evaluated. The respondent's task is to assign a number to each item depending upon whether the behavior characterizes his subject never (0), rarely (1), sometimes (2), or usually (3). Because the WBSI depends upon observations of the subject's behavior, it must be completed by a carefully instructed respondent who has frequent interaction with him. The field-testing of 49 children from the IMCP pilot project and two orthopedic schools produced an inter-rater reliability of .505 for the total score. The test-retest reliability, available only for the 25 IMCP and CT children was .694. The reliabilities of individual items appear in Table 1 and Appendix B.

Communicative skills were measured in terms of receptive and expressive language development. Non-verbal language development was estimated by the Peabody Picture Vocabulary Test (PPVT) and verbal skills by the Verbal Language Development Scale (VLDS). The published alternate-form reliability for the PPVT varies from .67 at a chronological age of six to .84 at age 18. The test-retest reliability for the 25 IMCP and CT children was .755. No reliabilities are reported in the VLDS manual. The test-retest reliability for the

25 IMCP and CT children was .822.

General educational achievement levels were established by the Peabody Individual Achievement Test (PIAT), a new but well-established instrument that is especially useful for testing achievement in low-functioning populations. The published overall reliabilities of the PIAT vary from .82 at the kindergarten level to .92 at grade 12. The subtest reliabilities range from .64 for Reading Comprehension to .89 for Reading Readiness.

Evaluation Procedure

The 10 IMCP and 15 CT children were tested three times, once in the spring of 1971, once in the fall of 1971, and once in the spring of 1972.

The ECFAT was administered three times by the same tester, a physical therapist who was given thorough orientation to the ECFAT's scoring procedures. The PPVT and PIAT were administered by a psychologist. Both testers were uninformed regarding the nature of the project. Thus, for these instruments at least, there was an almost ideal double-blind procedure.

These two testers administered their instruments in late April of 1971, late November of 1971, and late April of 1972. In every case their testing spanned a period of two weeks or less.

The WBSI and VLDS, by their nature, must be completed by a respondent who knows a child well, which precludes their being completed by an uninformed observer. The procedure for the administration of these instruments was to select a respondent who was in a position to observe objectively his subjects' social and self care behaviors. All institutions were asked to use the same respondent on successive test administrations, although staff turnover and children's advancement in programs resulted in many exceptions to this request.

Because the WBSI and VLDS evaluations were not scheduled for a particular day, each testing "date" covered several weeks.

The ranges of testing dates for the IMCP children were

from February 11 to March 5 in the Spring of 1971,

from December 14 to December 15 in the Fall of 1971,

and from April 30 to July 19 in the Spring of 1972.

The corresponding ranges for the CT children were

from June 24 to July 19 in the Spring of 1971,

from November 16 to December 16 in the Fall of 1971,

and from May 5 to July 19 in the Spring of 1972.

While the lack of control over these testing dates is undesirable, it should be noted that only two of the IMCP children had their final WBSI evaluations after May 8, 1972, while all of the CT children had theirs after that date. Thus there was moderate compensation for the differential WBSI testing dates in the spring of 1971.

Videotaped Evaluations

The acquisition of a Sony Videotape afforded the project a new dimension in evaluation. Any educational, rehabilitative or therapeudic program has multiple criteria for success and must be evaluated on all of them simultaneously. The recent acceleration in the development of multivariate analysis (e.g., Tatsouka, 1971; Cooley & Lohnes, 1971) has been one solution proposed to deal with multiple criteria. The strategy of multivariate analysis is to use several criteria simultaneously so that a single judgment can be made regarding their prediction by either a univariate or multivariate independent variable.

While mathematically elegant, multivariate analysis makes universally violated assumptions about its data and, furthermore, requires the translation of subjective criteria for success into numbers. A common cry of the practicioner is that the richness of a behavior is stripped away by this translation. One alternative to the conventional multivariate approach to multidimensional evaluation requirements was attempted by the IMCP project. The strategy of this alternative was to take periodic videotaped records of the IMCP children in six selected activities: eating, drinking, rolling over, potting, standing and/or walking, and free sitting.

At the end of the program, these were to be scrambled using the editor potential of the Sony videotape recorder. Then the teacher therapists were to rate the tapes, and order them according to the competence of the child. Kendall's coefficient of concordance would index the success of their ordering.

This procedure had two major virtues. First, it avoided the problem of translating rich, complex behavioral criteria into sterile checklist items. Evaluations could be based on behavior that was actually observed. Second, it permitted

the unbiased judgments of improvement to be made by the therapists who knew the children best. Since the tapes would be in random order, there would be no time cues to tell the rater the correct order of the tapes, thus assuring that the therapists' vested interest in the program's success would not bias their judgments.

Unfortunately the videotaped evaluations could not be made according to plan. First, the start of taping was delayed until April, 1972, just before final evaluations were made. Two subsequent tapings were made - one in early June, 1972, and one in late July, 1972. Second, the teacher therapist who was the facilitator on the first evaluation tape was not always available for subsequent tapings. It seemed undesirable to include individual differences in therapists as a source of variation in the rating of the children's performance. Third, although the effort was made to select behavior samples that would be independent of their settings, this effort was only partially successful. Discouraged by these difficulties and by limited time, but still enthusiastic about the approach, the staff elected to judge the tapes relating to those behaviors on which they thought improvement would be observed. One of the teacher therapists was then asked to select the April and July recordings of these twenty behaviors on which there were no date-specific cues. She was able to find only five such selections. The teacher therapist responsible for editing then scrambled the July and April recordings of the five selections, and five other therapists rated them according to the following instructions:

> I will show you the tape twice. The first time you are to watch the tape to judge the order of each child's activity. Ignore environmental cues, and make your decision only from the child's performance. Using a for April and b for July, note on your data sheet the order that you have determined to be correct. You may see all or any part of the tape again. Stop it anytime.
>
> I will then show the entire tape again; this time jot down environmental cues that you see. If you change your mind on the order due to environmental cues, just indicate it with an X, do not change any answers.

II. Results

This division of the report presents the data and their analyses that were used to evaluate the effectiveness of the IMCP procedures.

Section A presents the reliabilities of the project-made instruments. Section B presents the descriptive data on the 28 dependent variables that had been selected to compare the IMCP and Conventionally Trained (CT) children. Section C presents the inferential analyses of the data described in Section B. Section D describes a special analysis of the ECFAT, one that included statistical adjustments for the initial differences between the IMCP and CT groups on many of its subtests. Finally Section E presents the results of the videotaped evaluations.

A. Reliability of Dependent Variables

Careful field-testing of the project-made instruments and repeated measurements made possible several sources of reliability estimates for the measures that were used to compare the IMCP and the Conventionally Trained (CT) children. These are shown in Table 1. It is clear that both the inter-rater and the test-retest reliabilities of the Eau Claire Functional Abilities Test were unusually high. Although the inter-rater and test-retest reliabilities of the Wolfe-Bluel Socialization Inventory were less impressive than those of the ECFAT, they were certainly satisfactory. The test-retest reliabilities of the standardized instruments were very adequate despite their use on subjects at a very low range of ability.

B. Descriptive Data

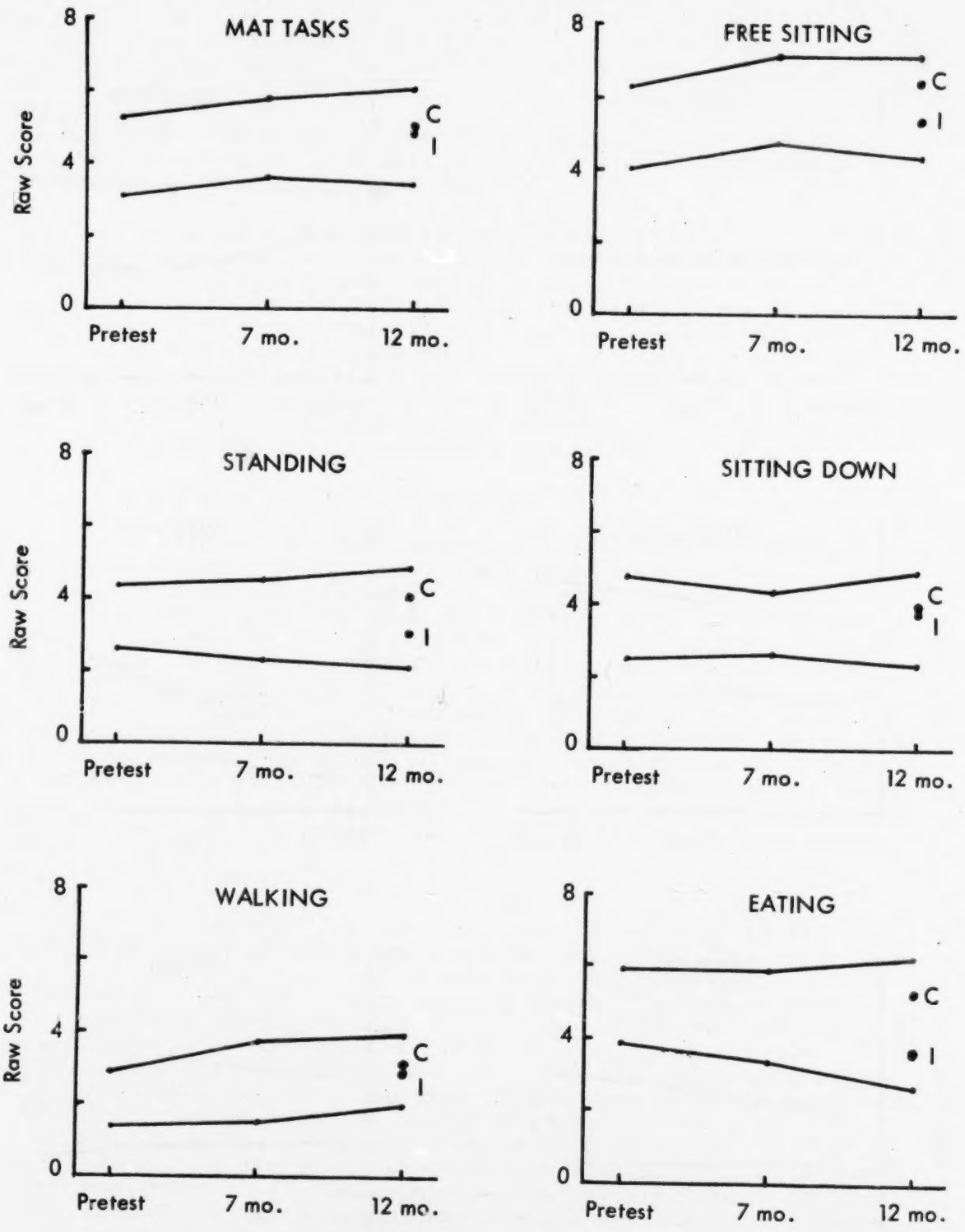
The results for the three administrations of the 28 dependent variables are plotted in Figures 1, 2, 3 and 4. The descriptive data are shown in Tables 2, 3 and 4. The general impression left by these descriptive data is that the Conventionally Trained subjects were initially superior to the IMCP children on both the cognitive measures (PPVT, PIAT, and VLDS) and the functional motor abilities (ECFAT), and that they maintained this superiority throughout the one-year evaluation period. In contrast, the performance of both groups is strikingly similar on the socialization measures (WBSI). With the exception of the IMCP children on the Functional Abilities Tests, both groups appeared to register improvement in all three areas of measurement.

Table 1. Instrument Reliabilities

Dependent Variable	Inter-rater		Test-retest	
	First Field Test WBSI n = 49 ECFAT n = 51	Both Field Tests n = 45	Field Sample n = 45	[1]Project Sample n = 25
ECFAT				
Mat tasks	.991	.957	.877	.937
Sitting	.981	.995	.892	.871
Standing	.993	.992	.844	.959
Sitting down	.959	.968	.839	.947
Walking	.990	.992	.819	.946
Eating	.996	.995	.951	.897
Chewing	.983	.950	.811	.838
Drinking	.993	.987	.931	.943
Hand skills	.996	.998	.942	.910
Writing	1.000	1.000	.847	.793
Dressing	.954	.990	.850	.928
Total	.997	.998	.958	.984
WBSI				
Self-care	.633	-	-	.503
Evmtl.Orient.	.100	-	-	.518
Independence	.444	-	-	.478
Communication	.792	-	-	.781
Emo.Maturity	.423	-	-	.652
Gr.Interaction	.563	-	-	.425
Intell. Growth	.464	-	-	.460
Total	.506	-	-	.694
PPVT	-	-	-	.755
PIAT				
Math	-	-	-	.742
Reading Rec.	-	-	-	.794
Reading Comp.	-	-	-	.884
Spelling	-	-	-	.721
Gen. Info.	-	-	-	.870
Total	-	-	-	.819
VLDS	-	-	-	.822

[1] Reliabilities in this column were based on three occasions of measurement adjusted by the Spearman-Brown procedure (Winer, 1962, p. 128) to reflect the per-occasion reliabilities, making them comparable to the others reported. The Groups by Occasions interactions have been partialed out using Winer's suggested procedure. The n in this column is 24 for the ECFAT.

Figure 1a. EAU CLAIRE FUNCTIONAL ABILITIES TEST.



Note: The heavy dots at the 12 month test indicate the means that have been adjusted for pre-test differences.

Figure 1b. EAU CLAIRE FUNCTIONAL ABILITIES TEST.

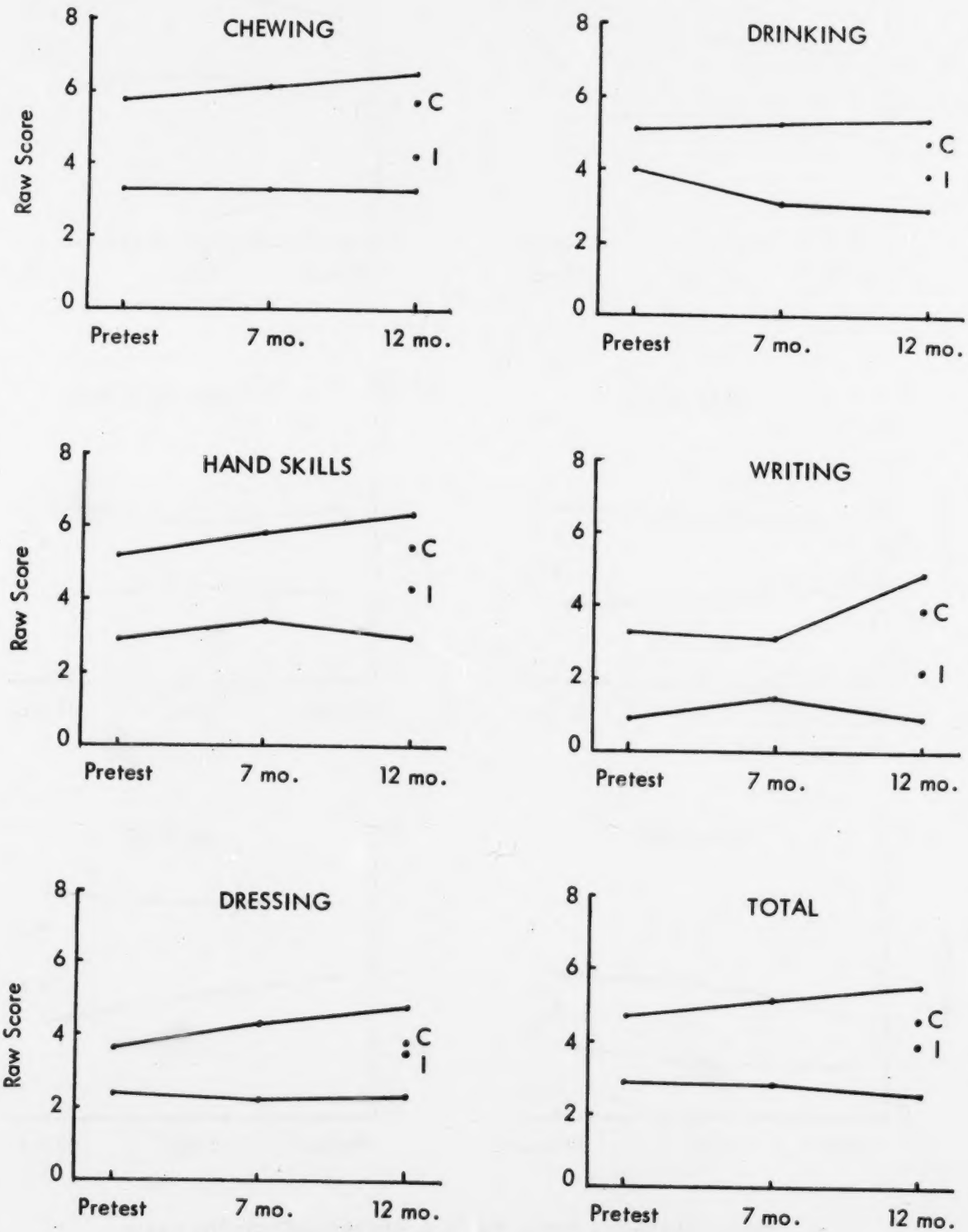


Figure 2a. WOLFE-BLUEL SOCIALIZATION INVENTORY.

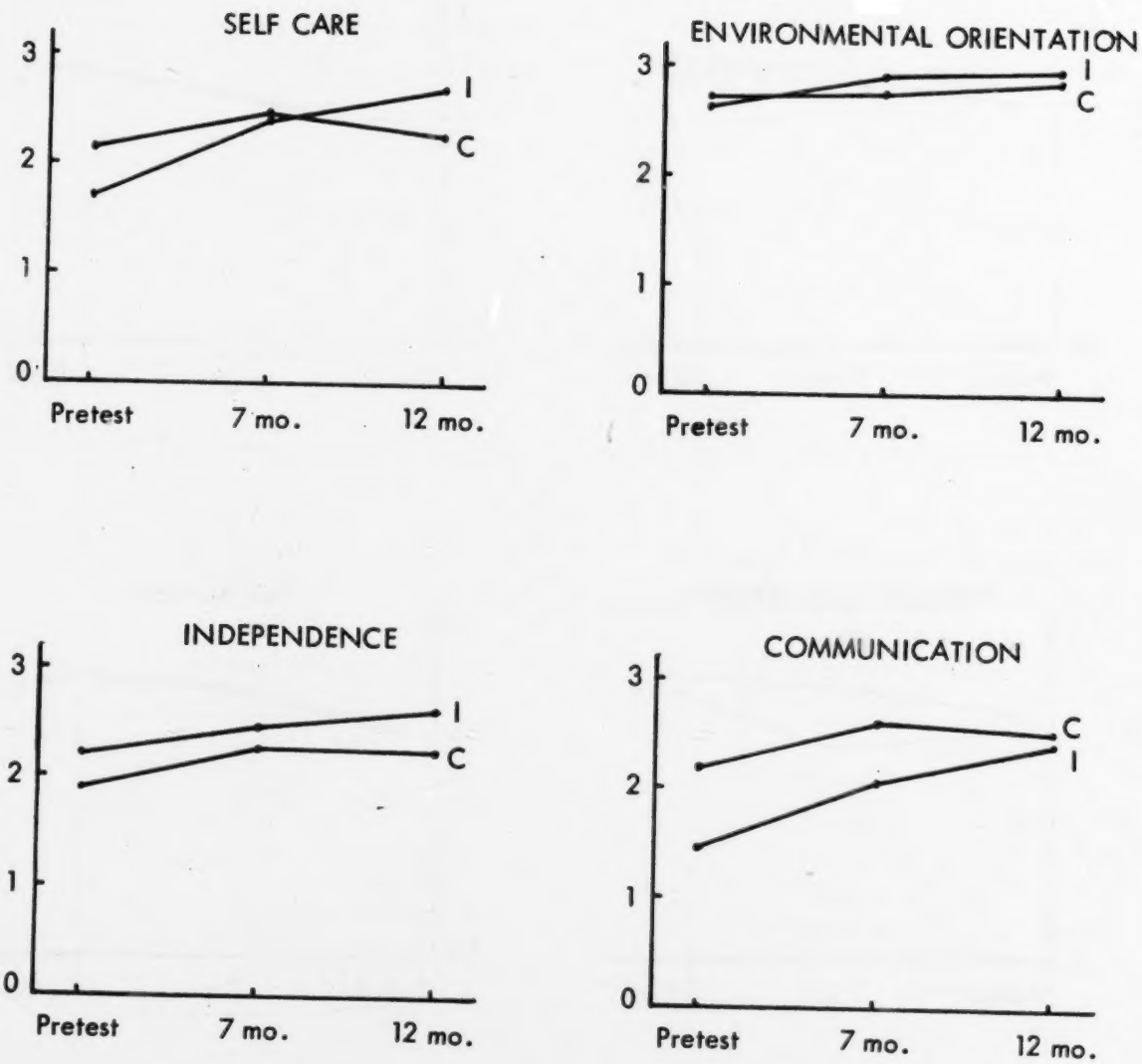


Figure 2b. WOLFE-BLUEL SOCIALIZATION INVENTORY.

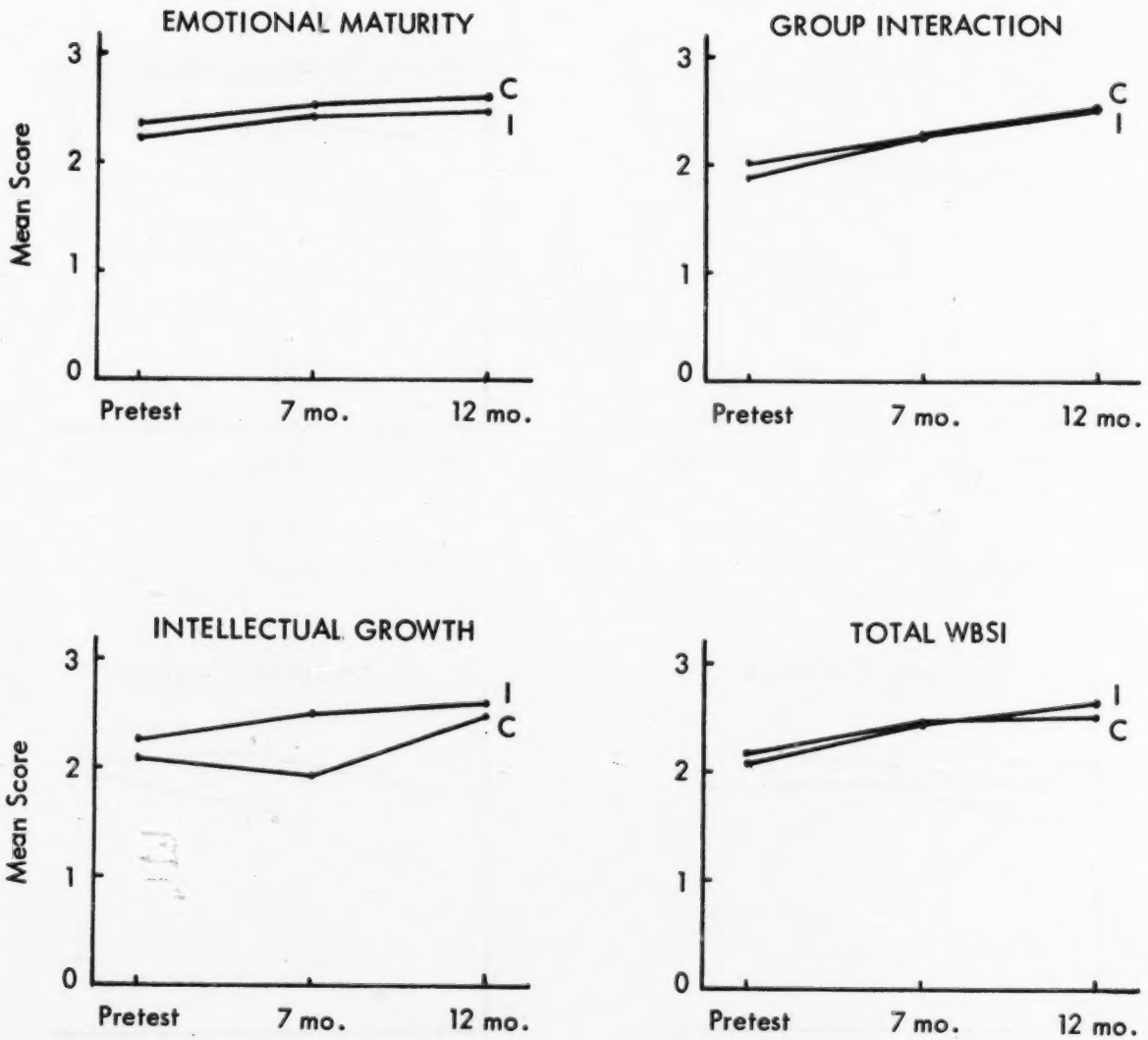


Figure 3. PEABODY INDIVIDUAL ACHIEVEMENT TEST.

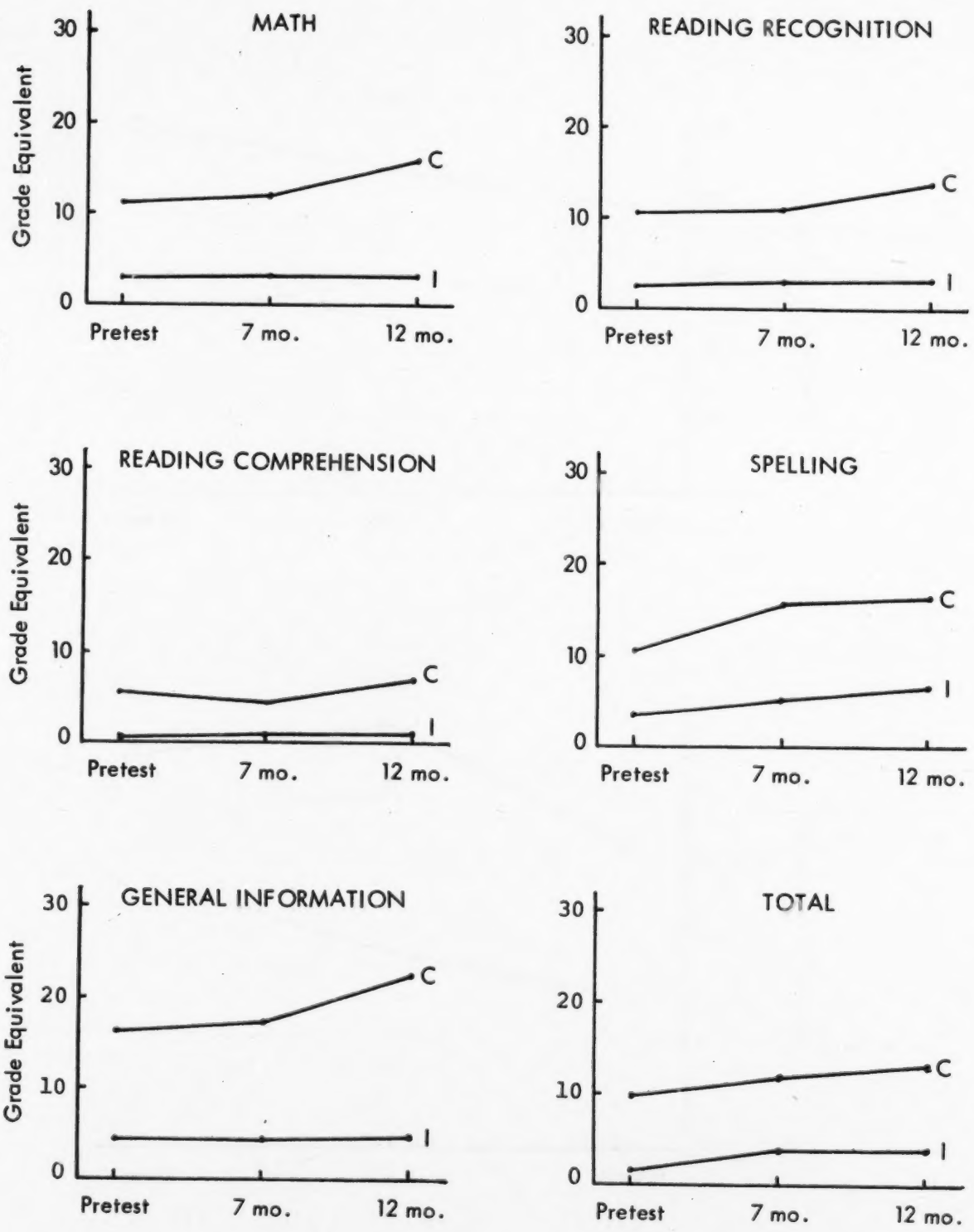
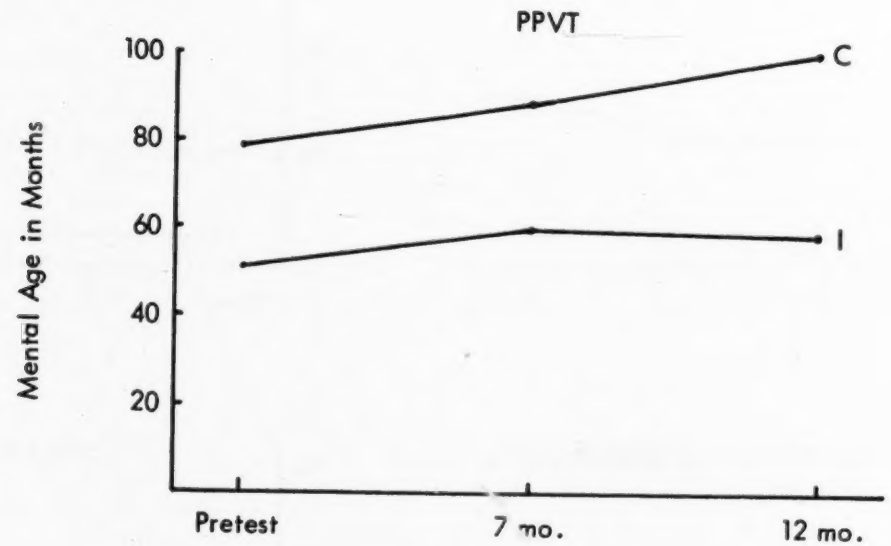
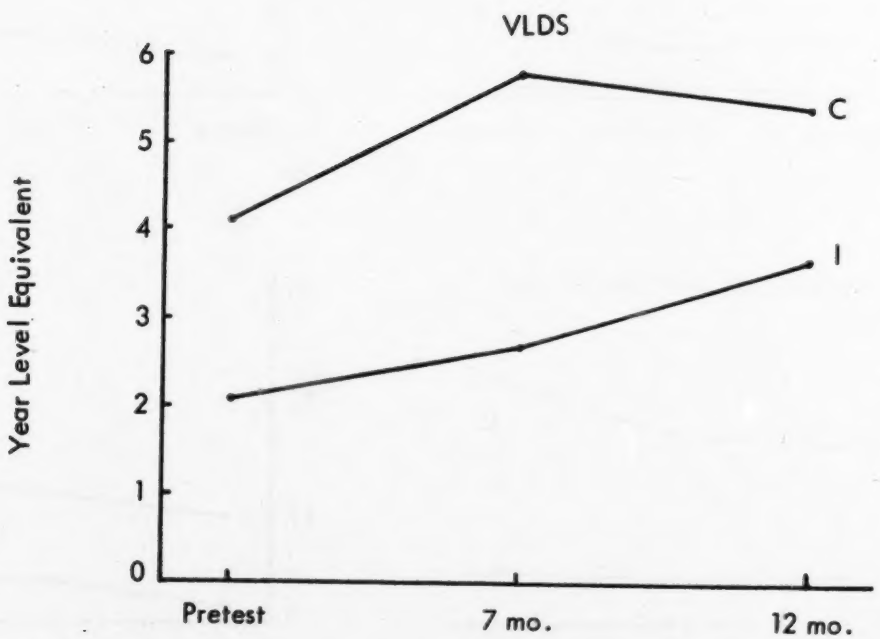


Figure 4. PPVT and VLDS.





While the progress of the two groups was parallel on most measures, there were some exceptions. The CT children appeared to gain more than the IMCP children on several subtests of the ECFAT, while the IMCP children appeared to gain more on the Self Care and Communication subtests of the WBSI.

C. Inferential Statistical Tests of Results

The inferential statistics that tested the significance of these descriptive data are shown in Table 5.

One Conventionally Trained subject was lost for the ECFAT only on Occasion 3. On all analyses not involving this case there were 10 IMCP children and 15 CT subjects, making one degree of freedom in the numerator and 23 in the denominator. In order to signal a significant departure from chance an F-ratio with 1 and 22 degrees of freedom must reach or exceed 4.30. All such F-ratios are starred in Table 5.

The analyses of most interest, the only ones that will be described here are those that cover the entire one-year interval, from the spring of 1971 to the spring of 1972. The F-ratios for these analyses are reported in the middle column (labeled $0_1 0_3$) for each source.

These analyses support the general impression expressed above. First, the F's for Groups indicate that the Conventionally Trained (CT) subjects' overall level of scoring was significantly above that of the IMCP subjects on five of the 11 ECFAT subtests, on the total ECFAT, and on seven of the eight cognitive measures. No significant differences were noted on any of the socialization (WBSI) measures.

Second, the F-ratios for Occasions indicate that improvements, while small, were statistically reliable because of the small intra-individual variability. When both groups were considered as a whole, significant gains were registered on two ECFAT subtests, (Walking and Writing), the ECFAT total, all of the WBSI subtests, WBSI total, and seven of the eight achievement measures. Two ECFAT subtests, Eating and Drinking, showed significant losses.

The most important comparisons are those associated with the Groups by Occasions interaction. Only five interactions were found to be significant. Three of these, (Eating, Drinking, and the ECFAT total) favored the CT group, while two (Self Care and Communication) favored the IMCP group.

Table 2. Means, Unbiased Standard Deviations and Possible Ranges for the 28 Dependent Variables for the IMCP and Conventionally Trained Groups on the First Test Administration.

Dependent Variable	Possible Range	IMCP n=10		Conventional n=15	
		Mean	S.D.	Mean	S.D.
ECFAT					
Mat tasks	0-8	3.1	2.96	5.3	2.87
Sitting	0-8	4.0	2.21	6.3	2.02
Standing	0-8	2.6	2.84	4.3	3.26
Sitting down	0-8	2.5	2.92	4.7	3.11
Walking	0-8	1.4	2.50	2.8	2.54
Eating	0-8	3.9	2.51	5.9	2.09
Chewing	0-8	3.3	2.50	5.7	1.94
Drinking	0-8	4.0	2.63	5.2	2.34
Hand skills	0-8	2.9	3.18	5.2	3.01
Writing	0-8	.9	2.03	3.3	2.99
Dressing	0-8	2.3	2.45	3.7	2.05
Total ECFAT	0-88	30.9	26.30	52.5	23.89
WBSI					
Self-care	0-21	12.1	4.82	15.1	4.96
Evmtl.Orient.	0-30	26.1	3.35	26.5	4.98
Independence	0-24	17.6	3.17	15.4	5.73
Communication	0-27	13.9	5.76	19.9	7.25
Emo.Maturity	0-30	22.4	3.24	23.5	4.09
Gr.Interaction	0-33	21.1	5.24	22.1	8.23
Intell. Growth	0-21	15.5	2.95	14.5	4.73
Total WBSI	0-186	128.7	18.96	136.9	33.66
PPVT	MA in Mos.	51.0	30.89	78.0	27.10
PIAT					
Math	Grd.Eq.	3.1	5.34	10.9	9.00
Reading Rec.	Grd.Eq.	2.2	3.12	10.6	8.72
Reading Comp.	Grd.Eq.	.0	.00	5.3	9.16
Spelling	Grd.Eq.	3.1	3.54	10.4	8.79
Gen. Info.	Grd.Eq.	2.1	3.48	16.1	15.04
Total PIAT		1.4	2.68	9.8	7.97
VLDS	Age Eq.	2.1	1.65	4.2	2.32

ECFAT = Eau Claire Functional Abilities Test.
WBSI = Wolfe-Bluel Socialization Inventory.
PPVT = Peabody Picture Vocabulary Test.
PIAT = Peabody Individual Achievement Test.
VLDS = Verbal Language Development Scale.

Table 3. Means, Unbiased Standard Deviations and Possible Ranges for the 28 Dependent Variables for the IMCP and Conventionally Trained Groups on the Second Test Administration.

Dependent Variable	Possible Range	IMCP n = 10		Conventional n = 15	
		Mean	S.D.	Mean	S.D.
ECFAT					
Mat tasks	0-8	3.6	2.91	5.8	2.62
Sitting	0-8	4.7	2.63	7.1	1.51
Standing	0-8	2.3	2.87	4.5	3.42
Sitting down	0-8	2.6	3.10	4.3	3.37
Walking	0-8	1.5	2.68	3.7	3.20
Eating	0-8	3.3	3.50	5.9	2.52
Chewing	0-8	3.4	3.06	6.1	1.64
Drinking	0-8	3.1	3.45	5.3	2.35
Hand skills	0-8	3.4	3.41	5.9	3.00
Writing	0-8	1.5	2.95	3.1	3.31
Dressing	0-8	2.2	2.30	4.3	2.43
Total ECFAT	0-88	31.6	29.51	56.1	25.56
WBSI					
Self-care	0-21	16.7	4.00	17.0	4.33
Envmtl. Orient.	0-30	28.8	1.48	27.7	2.58
Independence	0-24	19.4	2.59	18.3	4.18
Communication	0-27	18.2	5.31	23.2	3.97
Emo.Maturity	0-30	24.3	1.34	25.5	3.58
Gr.Interaction	0-33	24.9	5.97	24.8	8.19
Intell.Growth	0-21	17.1	2.56	13.5	6.72
Total WBSI	0-186	149.4	15.04	149.9	23.18
PPVT	MA in mos.	59.7	27.47	87.6	32.02
PIAT					
Math	Grd.Eq.	3.2	5.10	12.3	8.98
Reading Recog.	Grd.Eq.	2.5	3.90	10.7	8.30
Reading Comp.	Grd.Eq.	.0	.00	4.5	9.30
Spelling	Grd.Eq.	4.8	6.32	13.9	8.78
General Infor.	Grd.Eq.	2.2	5.10	17.3	15.54
Tota; PIAT		1.9	2.89	11.3	7.73
VLDS	Age Eq.	2.8	1.38	5.9	2.90

ECFAT = Eau Claire Functional Abilities Test
WBSI = Wolfe-Bluel Socialization Inventory
PPVT = Peabody Picture Vocabulary Test
PIAT = Peabody Individual Achievement Test
VLDS = Verbal Language Development Scale

Table 4. Means, Unbiased Standard Deviations and Possible Ranges for the 28 Dependent Variables for the IMCP and Conventionally Trained Group on the Third Test Administration.

Dependent Variable	Possible Range	IMCP n = 10		Conventional[1] n = 15	
		Mean	S.D.	Mean	S.D.
ECFAT					
Mat tasks	0-8	3.5	2.84	6.1	3.05
Sitting	0-8	4.4	2.59	7.1	1.70
Standing	0-8	2.1	2.69	4.8	3.40
Sitting down	0-8	2.4	2.99	4.9	3.24
Walking	0-8	2.0	2.83	3.9	3.22
Eating	0-8	2.4	2.91	6.1	2.35
Chewing	0-8	3.4	2.63	6.5	1.51
Drinking	0-8	2.9	3.54	5.4	2.53
Hand skills	0-8	3.0	3.53	6.4	2.82
Writing	0-8	.9	2.51	4.9	2.96
Dressing	0-8	2.3	2.26	4.6	2.77
Total ECFAT	0-80	29.3	27.35	60.8	24.77
WBSI					
Self-care	0-21	19.0	2.45	15.9	4.67
Envmtl. Orient.	0-30	29.5	.71	28.3	2.79
Independence	0-24	20.9	2.77	18.2	3.84
Communication	0-27	21.7	3.80	23.1	5.76
Emotional Mat.	0-30	24.8	2.15	26.1	3.01
Group Interaction	0-33	28.1	5.09	27.9	3.96
Intell. Growth	0-21	18.2	2.49	17.6	2.20
Total WBSI	0-186	162.2	15.40	157.0	20.89
PPVT	MA in mos.	59.1	30.46	100.33	27.89
PIAT					
Math	Grd.Eq.	3.0	4.99	16.1	13.25
Reading Recog.	Grd.Eq.	2.9	4.73	13.9	10.71
Reading Comp.	Grd.Eq.	.0	.00	6.9	11.97
Spelling	Grd.Eq.	6.3	8.15	14.2	9.56
General Infor.	Grd.Eq.	2.4	6.04	22.5	18.15
Total PIAT		1.9	3.45	13.5	10.37
VLDS	Age Eq.	3.7	1.82	5.4	2.75

ECFAT = Eau Claire Functional Abilities Test
WBSI = Wolfe-Bluel Socialization Inventory
PPVT = Peabody Picture Vocabulary Test
PIAT = Peabody Individual Achievement Test
VLDS = Verbal Language Development Scale

[1]n = 14 for all ECFAT subtests and the Total.

Table 5. F-ratios for the Group by Test Occasions Analyses of Variance for the 28 Dependent Variables.

Source	Groups			Occasions			G x O		
Occasions	O_1O_2	O_1O_3	O_2O_3	O_1O_2	O_1O_3	O_2O_3	O_1O_2	O_1O_3	O_2O_3
Variable									
ECFAT									
Mat tasks	3.78	4.08	4.55*	8.16*	2.56	<1	<1	<1	<1
Sitting	8.62*	9.54*	9.64*	12.53*	5.10*	1.13	<1	<1	<1
Standing	2.34	3.27	3.94	<1	<1	<1	2.11	3.12	<1
Sitting down	2.38	4.04	2.84	1.08	<1	<1	1.45	<1	3.37
Walking	2.56	2.39	3.09	7.97*	14.19*	1.83	3.58	<1	2.57
Eating	5.22*	8.46*	8.92*	<1	4.91*	3.85	<1	14.04*	3.70
Chewing	8.73*	11.07*	10.61*	1.11	2.68	1.51	<1	1.23	1.08
Drinking	2.59	3.22	4.46*	2.71	4.84*	<1	8.86*	6.78*	<1
Hand skills	3.66	6.07*	6.06*	5.47*	3.00	<1	<1	1.47	3.28
Writing	3.06	9.57*	6.28*	<1	5.07*	2.20	1.12	3.62	6.03*
Dressing	3.59	4.08	5.20*	2.71	3.20	<1	3.33	2.28	<1
Total	4.74*	7.02*	7.20*	6.30*	9.45*	<1	2.11	16.03*	6.94*
WBSI									
Self-care	1.06	<1	<1	10.85*	10.56*	<1	2.22	9.41*	5.65*
Evmtl.Orient.	<1	<1	1.99	5.86*	11.69*	3.70	1.11	1.35	<1
Independence	1.15	2.79	2.48	9.12*	11.19*	<1	<1	<1	<1
Communication	6.26*	2.53	2.93	21.66*	44.80*	4.43*	<1	8.96*	8.05*
Emo.Maturity	<1	<1	1.38	12.79*	18.44*	1.49	<1	<1	<1
Gr.Interaction	<1	<1	<1	3.72	29.30*	5.64*	<1	<1	<1
Intell.Growth	1.80	<1	2.21	<1	16.92*	9.60*	1.89	<1	2.49
Total	<1	<1	<1	18.88*	32.84*	15.24*	1.02	2.17	1.37
PPVT	5.51*	9.78*	9.87*	10.71*	15.17*	2.25	<1	2.66	1.75
PIAT									
Math	8.17*	8.58*	9.66*	<1	5.07*	2.76	<1	3.61	2.18
Reading Rec.	9.70*	9.75*	9.44*	<1	4.77*	5.35*	<1	1.50	2.33
Reading Comp.	3.05	3.33	3.01	<1	4.09	2.66	<1	2.73	1.77
Spelling	8.07*	6.33*	6.72*	6.35*	6.60*	<1	<1	<1	<1
Gen.Info.	8.97*	10.95*	10.36*	<1	4.98*	9.52*	<1	2.83	5.57*
Total	12.93*	12.29*	12.59*	1.86	5.07*	4.10	<1	2.12	2.73
VLDS	8.85*	4.98*	6.13*	19.28*	17.33*	<1	2.60	<1	11.33*

* $p < .05$

D. Analyses of ECFAT Posttest Scores That Were Adjusted for Pretest and Age

Because the CT group performed better than the IMCP group on the initial ECFAT administration, there was danger that subsequent improvement might be associated with ECFAT starting level rather than with treatment differences per se. As protection against this danger, a procedure was devised to correct for these initial differences. Test-retest data were available for 45 of the 49 subjects who had been used to field-test the ECFAT (see Appendix B of this report). These subjects were sampled unsystematically from a population of non-ambulatory cerebral palsied individuals whose ECFAT scores overlapped with both the IMCP and the comparison groups. Using these 45 cases a least squares prediction was made of each ECFAT posttest subtest for each subject from four predictor variables: the respective pretest and its square, and chronological age in years and its square. This analysis provided weights that could reasonably be used to predict the posttest scores expected for any IMCP or CT child from his pretest scores and his age. The groups could then be compared on their obtained posttest scores with their predicted posttest scores used as covariates. In other words this analysis compared the groups on obtained posttest scores that had been adjusted for any reliable influence of their predicted posttest scores.

In more formal terms, this analysis was a modified "two-stage" regression analysis. First the data (adjusted for inter-test interval) from each of the 12 variables from the field test sample were fitted to the following equation:

$$\hat{Z} = B_1X + B_2X^2 + B_3A + B_4A^2 + C$$

where $\hat{Z}$ is the predicted posttest.

B_i are weights that minimize the squared deviations of $\hat{Z}$ from Z, the obtained pretest plus 12/16 of the 16-month gain.

X is the pretest score.

A is the chronological age sixteen months after the pretest.

Then the B weights from the field-test sample were used to predict a posttest score for each of the 10 IMCP children and 15 CT children. Finally, a one-way analysis

of covariance compared the IMCP and control subjects on their obtained posttest scores with their predicted posttest scores used as covariates. The results of the first stage of this analysis appear in Appendix B. The results of the covariance analysis are summarized in Table 6. The adjusted means from this analysis are plotted in Figures 1a and 1b as heavy dots. The means indicate that the CT group maintained its superiority over the IMCP group even after the two groups had been statistically equated with regard to their predicted posttest. The adjusted posttest mean of the IMCP children was greater than that of the CT children on one subtest, Walking. Furthermore, the inferential statistics indicated that the CT children were significantly superior on the Chewing and Writing subtests as well as the Eating, Drinking and Total (cf. Table 5). (Although the F for Drinking was .13 short of that required for significance, there seems little point in changing the decision to reject the null hypothesis here.)

The R^2 column indicates that the covariate and group membership variables accounted for a substantial proportion of the observed posttest variance, a tribute to the reliability of the ECFAT. Indeed, the predictors accounted for 97.7 percent of the observed Total posttest variance.

The % Var. Pred. Post. column indicates that the covariate (the predicted posttest) accounted for between 59.2 and 91.7 percent of the criterion (observed posttest) variance.

The % Var. Groups column indicates that while groups were significantly different on five of the 12 variables, this source accounted for an average of only about 10 percent of the observed posttest variance.

As a supplement to the covariance analysis, one way analyses of variance were done using as scores the differences between a subject's predicted posttest and his observed posttest. The mean predicted posttest scores for each group are shown in columns 1 and 3 of Table 6. The F-ratios for this analysis are shown in column 8. Again the CT group was superior to the IMCP group on five of the 12 variables. However, Standing was added to the list of significant variables and Chewing was dropped.

Thus, the original impression that the Conventionally Trained children performed better on the tests of motor performance is, if anything, strengthened by the analysis that was designed to correct for any disadvanage that the

Table 6. Predicted Means, Adjusted Means, Squared Multiple Correlations, F-ratios, and Exact Probabilities of the Two-Stage ECFAT Analysis.

Variable	MEAN IMCP Pred.	IMCP Adj.	CT Pred.	CT Adj.	R^2	% Var. Pred. Post	% Var. Groups	F_{Gps}	F_{Diff}
Mat tasks	3.94	4.89	6.33	5.08	.843	.725	.118	<1	<1
Sitting	5.06	5.43	6.91	6.41	.785	.676	.109	2.98	3.11
Standing	3.11	3.10	4.73	4.07	.886	.827	.059	3.54	5.20*
Sitting down	3.25	3.82	5.43	3.91	.897	.841	.056	<1	<1
Walking	1.94	3.16	3.43	3.10	.926	.893	.033	<1	<1
Eating	4.39	3.60	6.23	5.28	.899	.745	.154	12.48*	18.48*
Chewing	3.70	4.42	5.88	5.77	.757	.592	.165	4.73*	2.77
Drinking	4.68	3.87	6.00	4.73	.915	.866	.049	4.19*	6.98*
Hand skills	3.71	4.34	6.13	5.47	.819	.739	.080	2.56	2.49
Writing	2.02	2.19	4.47	3.94	.788	.634	.154	5.40*	5.14*
Dressing	3.24	3.47	5.11	3.73	.850	.830	.020	<1	<1
Total	3.27	43.66	5.44	50.53	.977	.917	.060	9.98*	16.34*

*Note: $F_{.05}$ (1,21) = 4.32

$F_{.01}$ (1,21) = 8.02

IMCP children might have had with regard to starting level.

E. Videotaped Analyses

The videotaped analyses offered what appeared to be a simple approach to the evaluation of complex, multi-dimensional changes in behavior that are not amenable to objective measurement.

Despite the loss of data due to date-specific cues, the analysis of five situations by five raters was possible. Each rater was first asked to rate the behavior per se and then asked to note any cues that might be date-specific. The results of the videotaped evaluations are shown in Table 7. Column 1 shows that 19 of the possible 25 guesses were correct. Assuming that choices are independent of one another, a reasonable assumption in this case despite the repeated measurements on children and by teacher therapists, the binomial probability of 19/25 successes is .007. Column 2 indicates the success with which the therapists were able to ferret out cues that could pinpoint the taping date. It is clear that even these carefully screened selections were riddled with such cues - the chance probability of 22 successes on 25 attempts is less than .0005.

Thus, there is evidence that the teacher therapists were able to judge whether global improvements were made on several selected behaviors, but there is simultaneous evidence that there were non-behavioral cues that could have influenced their judgments.

Table 7. Results of the Videotaped Evaluations of Five Selected Behaviors by Five Teacher Therapists.

Behavior	Correct judgments of behavior	Correct citing of date-specific cues	Incorrect citing of date-specific cues	Maximum Possible
LuAnn Eating	2	5	0	5
Ted Potting	4	3	1	5
LuAnn Potting	4	4	0	5
Melody Rolling	4	5	0	5
LuAnn Walking	5	5	0	5
Total	19	22	1	25
Binomial probability	=.007	=.000	=.000	

III. Discussion and Conclusions

This section will discuss the results that were presented in Section II. Following this discussion will be three epilogues. The first (Section B), will comment on the validity of the practices of the IMCP project *vis a vis* those of the Institute for Movement Therapy, after which it was modeled. The second (Section C), will discuss the validity of the evaluation design. The third (Section D), will present recommendations for future integrated management programs.

A. Discussion of Results

The purpose of the analyses was to compare the IMCP and Conventionally Trained (CT) children on the 28 dependent variables that had been selected as valid criteria for the assessment of the effectiveness of integrated management. The major analyses relative to this purpose were the Groups by Occasions analyses of variance that used the data from the first and third occasions of testing.

These analyses partitioned the Groups and Occasions variance into three components: (a) the Groups effect, which contrasted the IMCP and CT children, (b) the Occasions effect, which contrasted Test Occasion 1 with Test Occasion 3, and (c) the Groups by Occasions interaction which contrasted the occasion-to-occasion change by the IMCP children with the same change in the CT children.

The Groups Effect

The most striking feature of the Groups effect is the superiority of the CT children on the functional movement and achievement variables. There was no exception to their superiority on the ECFAT. This superiority was significant for the variables of Sitting, Writing, Drinking, Eating, Chewing, and Total ECFAT. All achievement variables were associated with significant CT superiority except the PIAT reading comprehension, a variable on which no IMCP child scored above zero. In contrast, the groups were very similar on the socialization measures.

While these overall differences are theoretically independent of improvement, which is tested by the Groups by Occasions interaction, they are cause for considerable concern, for it is possible that a group's overall level of performance might be correlated with occasion-to-occasion changes in its scores. Two difficulties are especially common. First, if scores have a lower (floor)

and/or upper (ceiling) bound, as they do with the ECFAT and WBSI, then scores that are near the extremes typically show less change than scores in the middle of the scoring range. Fortunately there appears to be no severe floor or ceiling effects with the ECFAT, with the possible exception of Sitting on the second and third Occasions for the CT children. On the other hand, the IMCP children appear to manifest severe floor effects on all the achievement subtests. These statements are supported by noting the depressed standard deviations for these variables (see Table 2). These floor and ceiling effects make it very unlikely that the units of measurement are comparable for the two groups on these variables.

The second problem is more substantive. Even if it could be argued that the units are comparable for the two widely separated groups, it might be that a person with a higher (or lower, for that matter) score might "have more wo work with," and hence make greater improvement. While there is no completely adequate solution to this potential artifact of mismatched groups, the two-stage regression analysis described above provided a reasonable approach to mitigate its effects.

The Occasions Effect

Perhaps the most satisfying feature of the results was the finding of significant improvement on 18 of the 28 dependent variables. Significant deterioration was noted on only two variables, Eating and Drinking. Because this improvement is summed over groups, it is not subject to the qualifications discussed in the previous section. However, it should be noted that some variables were "carried" by one group or the other. The two variables showing loss did so only for the IMCP group. The gain on the ECFAT total was "carried" by the CT group. On the other hand, the WBSI variables were carried in the main by this IMCP group. Finally, both groups registered gains on the achievement measures--the lesser gains registered by the IMCP children were presumable due to the previously mentioned restriction in unit size associated with their extremely low score.

Groups by Occasions Interaction

The Groups by Occasions interactions indicate whether or not the occasion-to-occasion differences for one group were significantly greater than they were for the other. Looking again at the Occasion 1 - Occasion 3 analysis, there were six significant effects. Referring to Table 5 and to Figures 1 and 2, the CT children made greater gains on variables of Eating, Drinking, and Total ECFAT, while IMCP

children made greater gains on the variables of Self Care and Communication. The gains on the achievement measures did not differ significantly from one group to the other.

While these results are not lethal to the supporters of integrated management, neither are they cause for jubilation. Figure 1 indicates that the Eating, Drinking, and Total ECFAT variables were associated with sizable declines in performance despite the fact that these skills were given intensive daily attention in the IMCP program. It was these losses rather than any CT gains that resulted in the Groups by Occasions interactions on these variables.

It was noted earlier that the overall superiority of the CT children on the ECFAT raised the question of whether or not the gains of the two groups could be measured on the same scale. As a partial resolve for this problem the posttest scores of the two groups were adjusted statistically for any portion that could be reliably predicted by the pretest, by age, and by the squares of these two variables. This analysis should probably be considered to be more appropriate than the simple analysis of variance, because it adjusted for both linear and quadratic components of the two predictors. This analysis produced adjustments that reduced the absolute difference in posttest scores (see Figure 1 and Table 6). However, Chewing and Writing were added to the list of variables on which the CT children surpassed the IMCP children. Thus, the only reasonable conclusion is that the year saw an increase in the distance between the CT and the IMCP children on the functional movement skills, especially those dealing with hand and mouth control.

The comparison of the IMCP and CT children on the WBSI is not subject to the same interpretive impasse as that on the ECFAT, for the two groups scored comparably on the pretest. The significantly greater gains of the IMCP children on these tasks might be associated with the program's great stress on the role of the group as a motivational environment and instructional instrument. It should be noted that the Groups by Occasions interaction on the Total WBSI, while not significant, was consistent with the three subtests that were, $F(1,22) = 2.16$, $p \doteq .15$.

There must be some suspicion of results that show the comparison children to be superior to the project children on those instruments (functional movement and achievement) that were administered by the impartial testers but inferior on those instruments that were staff-administered. This

suspicion is partially allayed by the knowledge that the VLDS, which showed CT superiority similar to that of the other achievement measures, was also staff-administered. Furthermore, it must be assumed that the staffs of the conventional programs were just as likely to be guilty of a leniency bias as were the IMCP therapists. All things considered, the most reasonable conclusion is that the IMCP children made gains on socialization skills, especially Self Care and Communication, that surpassed those of the Conventionally Trained children.

Finally, the results relating to cognitive measures must be interpreted in most positive terms. Despite the severe floor effect, which would be expected to both reduce the size of units of measurement and to forebode limited cognitive growth, the IMCP children manifested gains that paralleled those of the CT children. These gains are even more impressive in view of the limited time devoted to formal classroom instruction. Only one and a half hours in the IMCP day were budgeted for school and even this time was frequently preëmpted by special activities. On the other hand, the integration of the program assured that the entire day's activity would support and reinforce the formal cognitive instruction.

In summary, it appears that the IMCP project achieved some goals and failed to achieve others. In the areas of socialization and cognitive skills, their improvement equaled or surpassed that of the Conventionally Trained children with whom they were compared. However, in the area of functional movements the Conventionally Trained children gained significantly while the IMCP children failed to gain significantly on any scale.

Videotaped Evaluations

The results of the videotaped evaluations indicated that the teacher therapists were able to make accurate judgments regarding the improvement made on selected behaviors of several children. However, this conclusion is subject to at least two rather serious qualifications. First, the behaviors that were selected were those that the therapists had pre-judged to have improved over the three-month period. Second, even the five situations that had been carefully screened for date-specific cues contained many of them.

With regard to the first qualification, the decision to select behaviors randomly had already been preëmpted by the presence of obvious date-specific cues on many recordings, and the staff wanted to use its limited editing and viewing time to confirm its impressions of the children's progress.

With regard to the second, the teacher therapists' assurance that their first mudgments were made solely in response to the children's performance is not very persuasive in view of their ability to cite so many date-specific cues on their second viewing of the tape. The most that can be said is that there are no data to contradict the possibility that observable improvement was made on these selected behaviors.

Nevertheless, the basic methodology appears to be sound, and the videotaped evaluations were regarded to be worth reporting for this reason alone.

B. Validity of the Project as an Instrument to Evaluate Conductive Education

The results of testing indicated that the integrated management procedures applied by the IMCP project were only modestly successful. However, it does not follow that conductive education procedures are ineffective. Logically there can be many reasons for a set of scores to behave in a certain way. In fact, many features of the present project could call to question its validity as an evaluation of conductive education.

The Project's Timetable

A major handicap, one that undoubtedly affected all the others, was the project's timetable. While two full years were devoted to "tooling up," the retrospective evidence is clear: the project was begun prematurely. Two years was simply insufficient time to make all the arrangements that were necessary to import such a major innovation and prepare for its adequate evaluation.

Furthermore, the timetable was squeezed on two ends. The project was not only begun prematurely, it was also phased out prematurely. Its validity would certainly have been increased by an extended timetable.

With more time the project could have provided its staff with more relevant experience and better credentials; it could have developed a stronger program; it could have sought a setting with which it was more compatible; and it could have developed a stronger evaluation plan.

Staff Turnover and Related Problems

The project's staff was unusually dedicated and hard-working. They maintained the strenuous daily program with determination and commitment, and took over its operation during the interim between the two directors with professional dedication and skill. Nevertheless, there were major staff problems. First, the staff was lacking in the formal credentials that might be considered prerequisite to the task of evaluating conductive education. At the beginning of the 15-month evaluation period in February, 1971, the teacher therapists consisted of five speech therapists, (B.A.) and one special education teacher (M.S.). While these disciplines are not irrelevant to therapy with the physically handicapped, the project conspicuously lacked a trained conductor or even someone trained in the conventional treatment of cerebral palsy. The supervisor held a B.A. in art history. Replacements for staff who were lost included an occupational therapist, another speech therapist, and a B.S. psychologist.

If the staff had only modest American credentials in the treatment of the motorically disabled, its exposure to the conductive education was also less than optimal. James and Margo House had several weeks of exposure to the Hungarian program. While two teacher therapists spent seven months at the Hungarian Institute studying conductive education, Mária Hári, the director of the Institute maintains that four full years of training (some of which would undoubtedly overlap with their speech therapy training) are prerequisite for competence as a conductor.

This European training was supplemented by periodic seminars, held during the project's two-year tooling-up period, to study theory and practice of conductive education and other therapies. During this period, the staff worked with several pilot programs to test ideas that grew out of their seminars. Finally, Margaret Parnwell, an English occupational therapist with considerable conductive education experience, spent three-and-a-half months with the project, teaching its staff and helping to develop its program.

The second staff problem was the high rate of turn-over and the necessity to expend resources to train replacements. During the course of the project, the director and three successive supervisors were lost. Of the original staff--a director, a supervisor and six teacher therapists--in January, 1971, only three teacher therapists remained at the time of the final evaluations in May, 1972. The turn-over was due to personal circumstances and not to project morale, but the recurring need to train new staff drained the project's resources and diluted its program.

Training of new staff was accomplished almost entirely as a practicum in the context of the ongoing program. There was only unsystematic, informal study of cerebral palsy and alternatives to its treatment. New trainees came to know integrated management in considerable isolation from both conventional knowledge about cerebral palsy and the programs after which the IMCP project had been modeled.

The discussion of staff turn-over would be incomplete without mention of the director's resignation and his replacement by an experimental psychologist who had substantial ignorance about cerebral palsy and its treatment. While this replacement permitted the survival of the project to a dignified completion, and assured a measure of objectivity in its evaluation, it reduced even further

the project's professional credentials and expertise in programming for the cerebral palsied.

Despite all these difficulties, there was an unusually strong continuity of program over the 15-month period of its evaluation; the staff was close-kint and tenaciously dedicated to its 13½ hour-a-day, seven-day-a-week program thruout the history of the project. While their training was informal, it was substantial and, in the judgment of the director at least, was valid preparation for their mission. Nevertheless, this staff turn-over and training cannot be dismissed as irrelevant to the validity of the project's evaluation of conductive education.

Incompatibility With The Setting

While the project's staffing problems were considerable, its most debilitating feature was its incompatibility with the setting into which it had been cast. It would be inaccurate to blame the institution itself or even the cottage for this debilitation--the Colony is staffed by highly competent and dedicated professionals and paraprofessionals. Rather, the debilitation arose from the disposition of all state residential institutions to view themselves as hospitals and not rehabilitative centers. The project was forced almost daily to compromise its principles in order to meet institutional requirements, despite the fact that the host Colony made innumerable exceptions in its operating procedures at the request of the project staff.

There seemed to be a basic discrepancy between the orientation of the Colony to custodial care of the mentally retarded and that of the project to active habilitation of the cerebral palsied. It should be said parenthetically that both staffs made a superb effort to treat the children with consistency and affection despite this basic incompatibility. But, regardless of its effect on the social climate, there can be no qualification to the conclusion that the Colony-IMCP incompatibility was a relentless drain on the energy, morale, and effectiveness of the IMCP staff.

Fidelity to the Hungarian Program

In the last analysis, the previous discussion is relevant only as it relates to the issue of fidelity. Despite its timetable, its staff difficulties, and its incompatible setting, did the IMCP project implement procedures that simulated those of the Hungarian State Institute for the Conductive Education of the Motor Disabled? In order to make a fresh assessment of the differences between the IMCP program and its model, two teacher therapists were commissioned to

travel to England and Hungary after final evaluations were made. They had no substantial surprises. The IMCP project closely modeled that which was seen in England and Budapest. However, there were differences between the program in the United States and the programs in Europe.

The Institute in Budapest serves several hundred children who range broadly in intelligence as well as motor dysfunction. Thus, it is possible to group children of similar disabilities so that programming can be more efficient and homogeneous. Because of its continuity, the Institute hosts on-going groups, some members of which are always experienced. A new member always has many models with similar disabilities to his own. These models provide motivation, know-how, and reinforcement for the newcomer.

By contrast, the IMCP project was an innovative effort that selected legally retarded children who were by-and-large not appropriate for the established orthopedic programs. These heterogeneous children were only minimally able to develop the motivating spirit that appears to characterize the Hungarian group.

The second contrasting feature was the setting. In contrast to the IMCP setting, the Budapest program is dedicated solely to the education of the cerebral palsied. All employees, whether they be cooks, cleaning women, students, head conductors or medical staff, are responsible to one common employer and their duties are all subordinated to the children's habilitation thru conductive education. Thus, the day's schedule is completely dedicated to the childrens' learning. The Colony staff who worked with the IMCP project were directly responsible to the Colony, not the project. For instance, the project aides had the dual function of completing the light housework and teaching some daily living skills to the IMCP children. Unfortunately, the aides were not free to work with or see each child learn these functional movements on plinths or in other exercise classes. The project's lack of control over aide scheduling resulted in over-staffing at some times and under-staffing at others. It was necessary for the IMCP children to adjust their working day to the schedule and regulations of the Colony; the IMCP program could not be modeled after the ideal working program in Budapest. Disparity in the training and approach of the two staffs also created discrepant goals--the cottage staff being primarily concerned about health and safety and the IMCP staff being concerned about increased self-care competence.

The physical structure of the Budapest Institute ideally reinforced the learning by the children while that of the Colony tended to inhibit learning. For example, the shape and arrangement of the Colony rooms were awkward for change of place because of the distances to be travelled. The room structure also promoted distractions during activities and made it difficult to divide the children into small, homogeneous groups. Even the Colony's easily-cleaned clay-tile floors contrasted with the Institute's linoleum-covered wooden ones. These tile floors were unsafe for normal therapy, making it necessary to protect the children with helmets. Helmets, which are forbidden in Hungary, discourage independence and interfere with perception and kinesthetic feedback.

Finally, the equipment used by the IMCP project did not exactly replicate that used in Hungary. The measurements of the Hungarian equipment appear in Section III-D, Table 7.

Despite these differences the IMCP project implemented goals and procedures that were essentially in agreement with those of the conductive education settings in England and Hungary. The children were taught in groups with individualization of goals. The therapy was integrated both in regard to the daily schedule and in regard to the teacher therapist. The emphasis was on self-motivation to increase motor and cognitive competence. Rhythmic intention and facilitation were used, especially by the IMCP staff, to assure that the child was contributing his maximum to every movement.

Adequacy of the Evaluation Plans

In addition to these considerations of the validity of the program *per se*, the project began with a less-than-optimal evaluation plan. While the picture is not completely negative (see Appendix B, Evaluation Instruments), the unavailability of suitable subjects precluded the random assignment of subjects to treatments in an experimental design. When assignment is non-random, as it finally became in the present study, any differences (or lack of differences) can be attributed to nonrandom factors. Indeed, the pretest data showed that there were substantial differences between the IMCP and Conventionally Trained groups on many of the measures used to compare them. While statistical adjustments can be made for background variables on which the two groups may differ, these adjustments depend mercilessly on assumptions that are difficult to meet. Furthermore, it is logically

impossible to control statistically all the background variables that could conceivably influence educational outcomes of nonrandom groups. Section III-C discusses the evaluation plan in detail.

Finally, the filmed evaluations, which were to present pictorial improvements, were never begun. Videotaped evaluations were done only in the twilight of the project. These evaluations more than any other could have permitted global, valid, dramatic evidence for the effectiveness of the IMCP procedures.

In summary, there is every reason to believe that the project underestimated the effectiveness of conductive education procedures in every domain. Any of the factors described above could have rendered it invalid as a test of the effectiveness of conductive education. Thus it would be premature to interpret the results of this study in terms that might inhibit the further investigation of conductive education as a viable approach for the treatment of cerebral palsy. While integrated management did not have the perfect opportunity or circumstances to simulate conductive education, the therapists showed creativity and dilligence in adopting its principles to fit the circumstances. It was their conviction that thru their therapy the IMCP children become less self-centered, became more independent, developed motoric, communicative and educative skills, became less therapist oriented, became more aware of their environment, themselves and others, and above all, learned that they had capabilities and could advance in these capabilities.

C. Rationale for the Experimental Design

The current study was designed and funded to test the efficacy of educational procedures that were patterned after those used at the Institute for Movement Therapy in Budapest, Hungary. The design and analyses employed to accomplish this evaluation are sufficiently unorthodox to require specific defense.

Two points are especially noteworthy, in that either one is of sufficient gravity to threaten the validity of the evaluation. First, the evaluation was supervised by the organization that had a vested interest in its success. Second, unavailability of subjects precluded their random assignment to the IMCP and the Conventionally Trained (CT) groups.

A major requirement of the IMCP evaluation design was to compensate for these two fundamental flaws. In the first case, substantial protection was achieved thru the application of a double-blind evaluation procedure. The subjects had no knowledge of their special status in the project, and the evaluators who tested the children on 19 of the 28 dependent variables were completely uninformed as to the nature of the project. Thus, except for the nine variables that were rated by the staffs who were in a position to make judgments about the social behavior of the children, the project was protected against the charge that evaluations were contaminated by staff bias. The criticism remained for the nine staff-rated variables (two of which were associated with IMCP gains that surpassed CT gains).

However, even with these variables, there was tentative a posteriori evidence to suggest that both the IMCP and the CT staffs maintained an objective impartiality on their ratings.

Eight of these variables (the WBSI) dealt with socialization and one (the VLDS) with achievement. The staff-rated achievement variable displayed the same general pattern as those that were assessed by the impartial, uninformed tester. The IMCP children began substantially below the CT children and maintained a rather constant distance from them as both groups gained substantially.

It seems reasonable to conclude that this evidence for impartiality on the staff-rated achievement variable provides support for their impartiality on the socialization variables as well.

The second flaw, the non-random assignment of subjects to treatment groups, is more difficult to confront. The only adequate evaluation design is one in which subjects are randomly assigned to contrast groups. All other approaches represent compromise of one sort or another. A randomization design was originally proposed for this project, but availability of subjects precluded its being implemented. Thus the final design of the present study was a compromise with the ideal.

The most defensible design in which different treatments are given to different intact groups is one in which groups are matched on a very reliable correlate of the dependent variable. The present study was characterized by very reliable correlates (the ECFAT pretest scores) of its most important dependent variables (the ECFAT posttest scores). However, the IMCP and contrast groups were not matched on these variables. This state of affairs prompted still further compromise. Two options seemed reasonable under the circumstances. First, with very high test-retest correlations, the analysis of variance of gain scores (posttest minus pretest) seemed to be most reasonable. (The analysis actually used was the algebraically comparable Groups by Testing Occasions analysis of variance.) The major assumption that might be questioned under this analysis is that of additivity of scores along the continuum measured by the instrument. That is, a gain from a score of zero to one is assumed to be the same as a gain from four to five, from seven to eight, etc. Such an analysis would tend to penalize those groups scoring at the extremes of the continuum relative to those scoring in the middle, for the changes in bounded extreme scores tend to be less in most distributions.

Inspection of Figures 1-3 indicated that there was only one (Environmental Orientation for the IMCP group) serious floor or ceiling effect, making it reasonable to assume that units were comparable for both groups. A second problem, generally regarded to be more serious than the first, related to mismatched groups deals with the tendency for gains to correlate with initial performance. It is almost axiomatic that a developing child with a higher pretest score is improving at a more rapid rate than an age-mate with a lower pretest score. This differential growth is, of course, independent of any intervention effects, which will add to or subtract from the normal growth for the child. It follows logically that two groups who differ on measurements taken prior to an intervention will gain at different rates regardless of whatever intervention might be administered to them. The inescapable conclusion is that groups who are initially mismatched can be validly compared for differential

intervention effects only if correction is made for their expected differential growth rates.

The strategy for confronting this problem in the present study was to establish growth norms based on a subject's pretest score and his age. Using these norms, an expected posttest score could be established for any subject whose pretest and age were known. Given an expected posttest score, it was possible to establish whether or not an individual's obtained posttest surpassed it. Furthermore, it was possible to compare the two groups to see if one surpassed its expectation more than another. This strategy assumes that a unit change is the same at all points on the scale, just as the comparison of simple gains did, but it does not assume that initial scores and gain scores are uncorrelated.

This strategy was implemented using the test-retest data that was available from the field-test population of 45 children, a population from Chicago orthopedic schools whose range of handicaps overlapped with those of both the IMCP and the CT groups. From these data regression weights were estimated for the prediction of an individual's posttest score from his pretest score, the square of his pretest score, his age in years and the square of his age. These weights were used to calculate a predicted posttest score for each IMCP and CT child. Finally an analysis of covariance compared the IMCP and CT children on the observed posttest with the predicted posttest used as the covariate.

While the results of these adjustments were disappointing, increasing the number of variables on which the CT children surpassed the IMCP children, these analyses must be considered the most appropriate for the comparison of the two groups. The high reliability of the ECFAT assured confident prediction norms in the first stage of the analysis (see Appendix B) and a highly reliable covariate in the second. (see Table 6).

This approach to the analysis of data from intact groups that are mismatched on a highly reliable predictor variable appears to be logically sound. Other researchers who are forced to compare progress in intact groups may find the approach useful, although it should never be seen to be a substitute for random assignment and, indeed, would have its best application if used in concert with random assignment.

In summary, despite the fundamental flaws in the evaluation design, the evaluation of the IMCP intervention was made with rather impressive design validity. The vested interest quandry was circumvented by the use of a double

blind procedure for 19 of the 28 dependent variables. The non-randomization issue was handled quite satisfactory in two ways. First, the groups by occasions analysis of variance compared the gains of the two groups. Second, using the ECFAT only, the data from the field-test subjects were used to adjust scores of the IMCP and CT groups so that the CT posttest superiority was not attributable to their pretest superiority.

D. Recommendations for Future Applications of Integrated Management

Having completed the project for the integrated management of cerebral palsy, it seems appropriate to speculate on conditions and factors that would make more effective and reduce the expense of future programs.

A number of variations of the IMCP procedures could be proposed. The present completed integrated management approach was structured as a residential program, but the format could be modified to allow the integrated management philosophy to be applied to day care programs. A day program is one in which the children remain at home (with parents or in foster homes) and attend a full day's treatment program five to seven days per week. Our recommendation includes the possibility of either a residential or day care program, for it is believed that the goals of integrated management can be accomplished in either setting. Both types of programs will be discussed separately and in detail. But whether the program is structured as residential or day care, many of the same conditions or recommendations apply. The terms used below are defined in detail in the IMCP Documentation Handbook, Appendix A of the final report.

General Recommendations

General recommendations concern:

(a) The geographic location,

(b) The children to be enrolled,

(c) The goals of the program,

(d) Staff and staff training,

(e) The use of professionals outside the integrated management team,

(f) The equipment to be used, and

(g) Evaluation procedures.

A prime concern of integrated management is that it can be made available to those who can profit from its application. Therefore, whether the program is residential or day care it must be situated in an area of need, a locale in which there is a sizable population of cerebral palsied, so

that local as well as external support can be generated for cerebral palsy service programs. Furthermore, the site chosen should have liberal treatment and building codes, so that the program is not choked to impotence by the well-intended but stifling institutional "protection" that has become so popular in recent years.

The most important factor of both the residential and the day care program is the population of cerebral palsied to be enrolled. A pre-requisite to any child's being admitted into either type of treatment program would be the administration of a complete battery of tests which include a physical and neurological examination, mental, psychological, visual perception, speech, hearing and social maturity tests. It is understandable that because of the various problems of the cerebral palsied, these tests are difficult to administer and score reliably; yet, it is essential to understand the capabilities and inabilities of the child so that his training is appropriate to his needs. Furthermore, such complete testing would later assist in evaluating the advancement of the individual and effectiveness of the therapy method for various types of cerebral palsy.

It has been a long-standing assumption that the younger the cerebral palsied individual is, the more effective therapy will be. Also taken into consideration is that in the group therapy approach there should be varied levels of ability in order that those of greater ability may provide motivation and models for those of lesser ability, and that those of greater ability will grow in responsibility, self-worth and fulfillment in helping those of lesser ability.

The capabilities of the individuals should range from non-ambulatory to ambulatory. The individual should have the ability to understand speech and language to a predetermined criterion depending upon the age group to be treated. Heterogeneous grouping of males and females should further include those of either mixed spastic athetoid variety or predominantly athetoid. In order to assure the necessary age level, group participation and heterogeneity, the group size should probably be between 10 and 15 children whose ages range from four to six.

Either the residential or day care program should embrace a pervasive integration of motoric, social, and academic goals. These should include the learning and improvement of motor skills such as sitting, standing, walking, writing, dressing, eating, drinking and fine motor skills. The learning and improvement of communication skills such as speaking, listening, reading, and writing should also be primary goals of either program. Finally,

social development and academic achievement should be included as essential.

Either program would set the following goals for each child:

(a) Independent functional motor performance,

(b) Ability to interact with all social forces in his environment,

(c) Self-expression that is functionally equivalent to his age group and

(d) Academic achievement that is preparatory for his admission into the mainstream of the educational system.

The teaching staff for such a program will vary in number depending upon whether it is residential or day care, but in either setting there must be a teacher or supervisor in charge of the program. This supervisor would be certified in one of the therapies for the motorically disabled or have a teaching degree in some type of special education. She should also acquire supplemental observation and training at the Institute for Movement Therapy in Budapest and/or with Ester Cotton in England. If the project is to be state-supported, she may be required to fulfill some other qualifications designated by the supporting organization as well.

The bulk of the day-to-day therapy would be in the hands of the teacher therapists. However, the training of the teacher therapist staff would most effectively be accomplished by the supervisor in charge of the program, for this will lead to the most consistent therapy.

The staff could be trained solely by the supervisor, but a residency either in England or in Budapest would seem essential to assure vigorous cross-fertilization of the international developments in integrated management procedures.

Either setting would require the consultation with professionals from outside the integrated management circle. The medical staff of such a program should be orientated to and understand the goals of integrated management and how these goals are sought within its procedures. Also needed may be the periodic consultation of a neuro-muscular physician, an orthopedist and a physical therapist if there are none on the staff. In any case, the staff should decide what consultation may be helpful and then orientate their consultants to the goals and philosophy of integrated

management. This is important in order that the consulting staff may enhance rather than dilute the integrated management program.

Another concern for either program is the equipment used. Special comments can be made about plinths, ladderback chairs, individual chairs and flooring. Equipment material and dimensions should closely match that used in Hungary. Equipment measurements appear in Table 8.

The plinths should be carefully designed for comfort and function. The design described in the Documentation Handbook was barely adequate. Slats should be flat but spaced for easy grasp. Support should be rigid at the ends, but not in the middle. Ladderback chairs should be at least 16 inches wide at the bottom and the backs should be flaired to 20 inches at the top. Every child should have a personal chair with whatever adaptations are necessary for him to sit independently at a table. Adaptations must be removable so that the child may sit without them at least once a day and support can be gradually lessened as the child gains in independence. All equipment must come in either variable or, preferably, adjustable sizes, so that a child's progress is never limited by the apparatus on which he is working.

The evaluation of the program would be difficult, but is an essential in determining the progress made by a child in his motoric movements, daily living skills, speech, socialization, and education. This could be accomplished by daily progress reports and periods of evaluation in the above originally tested areas every six months. Specific goals of the child such as his walking progress could be charted daily. A graphic representation of this charting would show either the progression or regression of the child, which would then aid the teacher therapist in modifying the child's therapy to more fully meet with his needs.

The general considerations discussed above apply to any setting. Discussion now focuses on those considerations that are peculiar to each. Each differs from the other in its intensity, the size of its staff, its cost and its parent training.

Specific Recommendations for a Residential Program

A program of integrated management in a residential setting would require a greater number of teacher therapists. The morning and afternoon shift would each probably require two trained teacher therapists with another teacher therapist covering a middle shift. A residential setting, of

Table 8. Measurements for Equipment from the State Institute for the Condictive Education of the Motor Disabled in Budapest, Hungary.

Small Plinth

Length - 53"
Leg height - 15½"
Leg width - 1½"
Width - 27½" (whole length - 31")
Slats - 2" wide, 3/4" between slats
2 cross-supports in middle end board.

Large Plinth

Length - 66½"

Small Chair

Height - 23"
Seat - 10½" from front legs
Seat - 12½" deep - 11½" wide
Back width - 14",
Height of leg - 12½"
Supports across bottom sides - 12½"

Stool

Width - 15½"
Length - 15½"
Height - 12"
Slats 1/2" apart

Large Chair

Seat height from floor - 32½"
Total chair height - 60"
Width of seat - 15½"
Entire seat - 17½" - 19" (across back) width

Large Ladderback

Width of ladder - 19½" - Rung 16 7/8" long
Height of entire chair - 43"
Width of seat - 16" - rung 2½" circumference
Height of seat from floor - 17"
2 rungs on bottom - back
4 rungs plus top bar on top
Length of seat - 15½" from back bar
Length of whole seat -18"

course, would also require personnel to care for overnight monitoring, cleaning and other household chores. The intensity of a residential program would be quite heavy and consistent, with the child beginning to learn daily living skills as soon as he awakens at 6:30 a.m. and continue until 8:00 p.m. The daily schedule may be similar to the following:

6:30	Rising, pottying, pushing off plinths.
6:45	Face and hand washing at tables.
7:15	Breakfast.
8:00	Dressing for the day.
8:30	Free play.
9:00	Prone and supine exercises on plinths.
10:00	Juice and pottying.
10:30	Standing and walking exercises.
11:45	Pre-meal activities such as:
	Hand washing.
	Putting toothpaste on brush.
	Pouring of water into glasses.
	Putting on bibs.
	Wringing out washcloths.
12:15	Lunch and pottying.
1:00	Rest, free play.
1:30	School.
3:00	Juice and pottying.
3:30	Hand and sitting exercises.
4:30	Pre-meal activities for supper same as noon.
5:00	Supper.
6:00	Dressing for bed.
7:00	Final pottying.
7:30	Bedtime story.
8:00	Lights out.

Another consideration of a residential program is the orientation of the program to the parents. The goals of their child within the program and its treatment method should be carefully explained, for one difficulty with the residential program is that continuous contact between the parent and child is gone. The result is a re-adjustment period for parents and child when the child returns home for vacation or at the termination of his treatment. Therefore, in order that this re-adjustment difficulty is kept to a minimum, and also to ensure the child's continual progression rather than regression at home, it is essential that parents be trained in how to handle their child, what to expect of him and also how to increase his independence. This could be accomplished by progress reports to parents and also pre-vacation training sessions in which parents worked with their child under the supervision of a teacher therapist.

The cost of a residential program would include salaries of therapists, equipment, supplies, food, shelter, clothing, and the salary of cleaning personnel and a night-watch. Medical care and consultation must also be provided. The cost of a residential program would be greater than that of a day care program.

Specific Recommendations for Day Care Programs

The conductive education philosophy could easily be applied to day care programs. In the day program, just as in the residential program, the daily schedule would be designed to include motor learning and applications of learned motor skills. By this it is meant that activities such as the plinth, hand, standing and walking exercises would be implemented along with opportunities to use improved motor skills in eating, dressing, and grooming. The major disadvantages in such a program would be the limited amount of time available for application opportunities and less consistent handling of the child. Early morning rising, dressing and grooming needs are natural times for functional application. This time would be unavailable in a day program. Dressing may then consist of removing and putting on coats, hats, scarfs, and other outdoor wear at the beginning and end of the day. Morning washing could be replaced by washing up before and after lunch. Juice breaks and the noon meal could provide eating and drinking applications. Thus, the day-care program could preserve some of the advantages of learning functional skills when they naturally occur in the individual's life.

In a day care setting it is essential that there be a more extensive parent training progran than that used in a residential setting. This training method is of prime importance because those times which would normally be covered by teacher therapists in a residential setting would be the responsibility of the parents in the day care program. This training would ensure that the performance level attained in the treatment program could be maintained in the home setting. The child could then remain in continuous contact with his parents which would make re-adjustment from his school setting to home less difficult. Parents would again be trained in handling their child, what his capabilities are and how to further develop his daily living skills. This could be accomplished by parents' participating in activities as facilitators under the guidance of teacher therapists. This kind of participation would ensure a thorough understanding of the procedures, techniques and expectations of the child in his home environment.

The day care program is an attractive alternative to the residential plan, since several economies would be effected: one shift of teacher therapists could handle the entire program; and the cost of food, laundry, heat and medical care would be greatly reduced.

A sample schedule for a day program of the type described above is as follows:

7:45	Children arrive and remove outdoor wear.
8:15	Plinth series.
9:15	Children walk to tables for juice and pottying.
10:15	School.
11:45	Hand and face washing.
12:00	Lunch, toothbrushing, pottying, cleaning of hands and face.
1:00	Hand and/or sitting exercises.
2:00	Juice and pottying.
2:45	Standing and walking exercises.
4:00	Putting on outdoor wear and moving to cars.

While integrated management could be practiced in other settings, the ingredients of group participation and an integrated daily program demand that it resemble one or the other of the settings that have just been described. Regardless of whether it is presented in a day care or in a residential setting, the principles of integrated management provide for a future of independence and meaningful community living for the motorically handicapped child.

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V. Raw Data

The raw data are presented in Tables 9 and 10 for the ECFAT, Table 11 for the WBSI and Table 12 for the PPVT, PIAT, and VLDS.

All four tables are listings of the actual cards that were used for data analysis. There is one line for each card. Each of the 10 IMCP subjects and 15 CT subjects has three cards, one for each evaluation occasion. The first five columns of each card show the approximate date of testing. The next column, if punched, is 1 for the IMCP group and 0 for the CT group. After a blank, the next two columns are to be ignored, and the next two present the subject's number--from 1 to 10 for the IMCP subjects and from 11 to 25 for the CT subjects. The data follow the subject number.

For the ECFAT (Tables 9 and 10), the next 11 numbers are the 11 subtest scores in the same order as in all the tables. The twelfth number is the sum of the 11 subtests, the thirteenth number, when it appears, is the month of birth, the fourteenth is a two-digit year of birth, and finally, the fifteenth is the subject's chronological age in February, 1971, times 100 represented as a four-digit number (e.g., Subject #1 was six years old in February, 1971).

For the WBSI the next seven numbers are the scores on the seven subtests in order and the final score is the sum of the subtest scores.

For the cognitive measures, the next number is the subject's PPVT mental age in months. Following the PPVT are the grade equivalent scores for the five PIAT subtests and for the PIAT total. Finally, there follows the VLDS age equivalent. When there is no decimal point punched, one is assumed between the first and second numbers of this field, e.g. the first IMCP subject had a VLDS score of 2.28.

Table 9. Raw Data for the ECFAT Evaluations of the IMCP Children on Three Occasions.

04/711	0501	4	6	6	6	2	7	6	8	8	6	4	63	2	65		
12/711	1501	5	8	3	6	1	8	7	8	8	8	4	66				
04/721	2501	5	8	2	6	3	7	6	8	8	8	4	65				
04/711	0502	8	7	7	7	6	8	7	8	7	0	7	71	5	64		
12/711	1502	8	8	5	8	6	7	7	8	8	6	7	82				
04/721	2502	8	8	5	7	7	5	2	7	7	0	7	67				
04/711	0503	0	2	2	1	0	2	0	2	0	0	0	10	2	63		
12/711	1503	0	2	2	0	0	0	0	1	0	0	0	3				
04/721	2503	0	2	2	0	0	0	0	0	0	0	0	2				
04/711	0504	8	7	7	7	6	7	7	7	6	3	6	70	10	60		
12/711	1504	8	8	7	7	7	6	6	7	7	0	5	69				
04/721	2504	8	7	7	7	7	7	6	7	7	0	5	69				
04/711	0505	4	2	1	1	0	2	1	2	0	0	1	13	7	59		
12/711	1505	4	3	1	1	0	0	1	0	0	0	1	11				
04/721	2505	2	2	1	1	0	0	0	0	0	0	1	8				
04/711	0506	0	2	1	1	0	2	0	0	0	0	1	9	8	59		
12/711	1506	0	2	1	1	0	0	0	0	0	1	1	6				
04/721	2506	1	2	1	1	0	2	0	0	0	0	1	8				
04/711	0507	1	2	2	1	0	0	2	2	2	1	1	11	10	62		
12/711	1507	1	2	2	1	0	2	1	0	1	0	1	11				
04/721	2507	1	2	2	1	0	0	0	0	0	0	1	8				
04/711	0508	2	6	4	1	1	0	6	4	3	3	1	29	2	61		
12/711	1508	2	6	4	1	1	0	1	4	6	5	1	30				
04/721	2508	2	6	4	1	1	0	1	4	6	4	1	30				
04/711	0509	1	3	1	1	0	0	0	2	3	2	1	18	5	57		
12/711	1509	4	3	2	1	1	0	1	5	6	4	1	25				
04/721	2509	4	3	2	1	1	0	1	2	2	2	2	24				
04/711	0510	3	3	1	1	1	0	0	2	2	0	1	15	10	63		
12/711	1510	4	5	0	1	0	0	2	0	0	0	1	13				
04/721	2510	4	6	0	1	0	0	2	0	0	1	1	14				

Table I0. Raw Data for the ECFAT Evaluations of the Conventionally Trained Children on Three Occasions.

04/710	0511	8	8	7	7	2	4	6	4	5	3	6	60	7	59
12/710	1511	8	8	7	7	2	6	6	5	5	3	5	62		
04/720	2511	8	8	7	7	3	5	6	2	6	4	6	62		
04/710	0512	4	6	1	4	1	7	7	6	7	4	3	50	8	61
12/710	1512	4	8	3	3	3	7	7	6	6	4	2	53		
04/720	2512	4	8	3	3	2	7	8	6	7	6	3	57		
04/710	0513	1	2	0	0	0	6	6	6	2	5	1	24	3	57
12/710	1513	1	6	0	0	0	6	6	6	7	4	2	38		
04/720	2513	0	4	0	0	0	7	7	5	8	6	2	39		
04/710	0514	8	8	7	7	6	8	7	7	7	7	5	77	2	64
12/710	1514	8	8	8	8	8	8	7	7	8	8	6	84		
04/720	2514	8	8	8	8	8	8	6	7	8	8	6	83		
04/710	0515	4	7	2	5	1	6	5	6	5	4	5	50	1	60
12/710	1515	5	8	1	1	0	6	5	6	7	0	5	44		
04/720	2515	8	8	1	2	0	7	6	6	7	4	6	55		
04/710	0516	7	8	7	7	3	8	7	8	8	6	6	75	7	64
12/710	1516	8	8	7	7	6	8	8	8	8	7	8	83		
04/720	2516	8	8	7	7	6	8	8	8	8	8	8	84		
04/710	0517	1	5	1	1	0	6	6	2	1	0	1	24	8	60
12/710	1517	3	6	1	1	0	2	6	2	1	0	1	23		
	17														
04/710	0518	8	8	8	8	4	6	7	7	5	6	5	72	4	61
12/710	1518	8	8	8	8	7	7	7	7	8	7	6	81		
04/720	2518	8	8	8	8	7	7	7	7	8	7	6	81		
04/710	0519	7	6	6	6	4	5	6	4	8	0	4	56	12	62
12/710	1519	7	8	7	3	5	7	6	4	8	0	4	59		
04/720	2519	8	8	7	6	6	6	6	4	6	7	2	66		
04/710	0520	8	8	8	8	6	8	7	6	8	7	6	80	1	63
12/710	1520	8	8	8	8	7	8	7	7	8	7	7	83		
04/720	2520	8	8	8	8	7	8	7	7	8	7	7	83		
04/710	0521	8	7	8	8	7	7	7	6	7	0	4	69	10	64
12/710	1521	8	8	8	8	8	7	6	6	7	0	7	73		
04/720	2521	8	8	8	8	8	7	7	8	8	0	7	77		
04/710	0522	3	2	0	0	0	0	1	0	0	0	1	7	10	61
12/710	1522	4	3	0	0	0	0	1	0	0	0	1	9		
04/720	2522	3	4	0	0	0	0	2	0	0	0	1	10		
04/710	0523	8	8	6	7	6	7	8	8	8	7	6	79	6	60
12/710	1523	8	8	7	7	6	8	8	8	8	7	6	81		
04/720	2523	8	8	7	7	6	7	8	8	8	7	8	82		
04/710	0524	4	6	2	2	2	7	3	6	7	0	2	41	10	63
12/710	1524	6	7	3	3	3	7	6	6	7	0	3	51		
04/720	2524	6	8	3	5	2	7	7	6	8	4	2	58		
04/710	0525	1	6	1	1	0	4	3	2	0	0	1	19	6	62
12/710	1525	1	5	0	0	0	2	6	2	0	0	1	17		
04/720	2525	0	4	0	0	0	2	6	2	0	0	0	14		

Table 11. Raw Data for the Wolfe-Bluel Socialization Inventory (WBSI) Evaluations of the IMCP and CT Children on Three Occasions.

03/71	101	10	19	18	10	15	14	15	101
12/71	1	20	30	21	15	24	28	20	158
04/721	1101	21	30	23	24	22	28	21	169
06/71	102	12	26	20	24	24	23	21	150
12/71	1	14	26	20	25	24	33	20	167
04/721	1102	21	30	24	26	24	33	20	178
06/71	103	3	28	17	11	20	22	17	118
12/71	1	10	30	15	13	24	23	18	133
04/721	1103	15	30	19	20	24	24	19	152
06/71	104	15	27	21	11	23	28	17	142
12/71	1	18	28	23	20	23	31	17	160
04/721	1104	21	30	24	21	25	33	18	172
06/71	105	16	29	17	13	23	22	16	136
12/71	1	14	30	22	15	22	21	18	147
04/721	1105	18	30	22	22	26	26	18	162
02/71	106	5	25	13	11	24	16	14	109
12/71	1	9	30	16	11	25	20	17	128
04/721	1106	14	29	17	16	28	27	19	150
06/71	107	13	28	18	11	26	29	18	143
12/71	1	17	30	18	18	25	31	18	157
04/721	1107	20	30	21	24	26	33	20	174
02/71	108	18	30	22	23	26	24	11	154
12/71	1	20	29	20	26	25	26	16	162
04/721	1108	21	29	21	26	25	32	18	172
02/71	109	17	22	18	18	21	18	12	126
12/71	1	19	27	21	24	27	22	16	156
04/721	1109	20	29	22	23	27	28	17	166
02/71	110	11	27	12	7	22	15	14	108
12/71	1	16	28	18	15	24	14	11	125
04/721	1110	18	28	16	15	21	17	12	127
07/71	0711	11	26	17	19	24	21	18	136
12/71	1	17	29	16	22	25	26	18	153
04/720	1111	19	30	24	23	25	29	19	169
06/71	112	19	30	17	25	25	33	17	166
12/71	1	12	29	22	23	29	24	5	144
04/720	1112	13	29	13	24	27	28	16	150
07/71	0713	10	27	15	16	22	18	16	124
12/71	1	12	23	11	27	21	21	13	128
04/720	1113	14	24	20	24	25	23	15	150
05/71	114	18	26	10	25	21	16	12	128
12/71	1	21	28	14	24	22	30	16	155
04/720	1114	19	28	19	25	24	32	18	165
07/71	0715	21	30	23	27	30	32	21	184
12/71	1	20	29	23	27	30	31	20	180
04/720	1115	15	28	19	27	28	31	19	167
05/71	116	8	14	6	17	19	10	10	84
12/71	1	11	26	21	24	24	30	14	150
04/720	1116	17	27	20	23	24	26	15	152
06/71	117	21	30	23	27	30	33	21	185
12/71	1	14	30	24	25	30	30	21	174
04/720	1117	13	30	21	27	30	32	21	174
05/71	118	18	29	17	24	26	20	16	150
12/71	1	21	28	14	27	28	30	13	156
04/720	1118	19	30	20	27	29	30	18	173
05/71	119	12	26	12	15	23	14	12	119
12/71	1	21	28	17	19	22	28	18	153
04/720	1119	21	28	18	22	25	28	18	160
05/71	120	19	30	23	27	23	31	16	169
12/71	1	21	30	24	26	29	29	20	179
04/720	1120	21	30	24	27	29	31	20	182
06/71	121	15	16	13	1	18	14	7	84
12/71	1	16	21	14	12	21	18	21	104
04/720	1121	8	19	10	5	19	19	13	93
07/71	0722	10	30	16	13	25	23	16	132
12/71	1	9	28	16	20	27	26	10	136
04/720	1122	8	29	15	16	24	27	18	142
05/71	123	18	30	22	27	28	31	19	175
12/71	1	20	30	22	26	28	31	20	177
04/720	1123	20	30	19	25	25	29	18	166
05/71	124	20	27	10	17	16	9	6	105
12/71	1	19	27	14	22	20	18	12	132
04/720	1124	21	27	16	24	23	22	16	149
05/71	125	7	27	7	18	22	21	10	112
12/71	1	21	29	17	24	27	0	0	118
04/720	1125	10	30	15	27	29	32	20	163

Table 12. Raw Data for the PPVT, PIAT, and VLDS Evaluations of the IMCP and CT Children on Three Occasions.

06 711	0601	23		3		8			228		
12/711	1601	32	3	13		15		7	3.90		
04/721	1601	28	1	11	0	10	0	2	6.75		
06/711	0602	97	14	10		8	5	8637			
12/711	1602	99	14	3		12	16	7	5.75		
04/721	1602	99	14	12	0	7	19	11	6.87		
06/711	0603	43							144		
12/711	1603	35		2					1.67		
04/721	1603	58	6	0	0	10	0	0	2.67		
06/711	0604	51							133		
12/711	1604	53							1.61		
04/721	1604	47	0	0	0	0	0	0	1.94		
06/711	0605	94	11	3		6			2267		
12/711	1605	92	11	2		14		3	2.06		
04/721	1605	92	0	2	0	25	0	3	2.44		
06/711	0606								111		
12/711	1606	30							1.89		
04/721	1606	24	0	0	0	0	0	0	3.30		
06/711	0607	75		3		3			117		
12/711	1607	87	3	2		4			2.00		
04/721	1607	92	9	4	0	11	0	3	3.70		
06/711	0608	55	6	3		6	8	4	55		
12/711	1608	80	1	3		3	5	2	4.17		
04/721	1608	87	0	0	0	0	5	0	4.17		
06/711	0609	30					x		244		
12/711	1609	37					1		2.72		
04/721	1609	32	0	0	0	0	0	0	3.10		
06/711	0610	37							133		
12/711	1610	31							1.94		
04/721	1610	32	0	0	0	0	0	0	1.72		

06/710	0611	65	11	13		20			11194		
12/710	1611	87	3	10		29			10 3.20		
04/720	1611	92	21	8	0	17	0	8	2.89		
06/710	0612	73							525		
12/710	1612	85	9	12		14	14	11	5.12		
04/720	1612	87	14	14	0	14	37	16	5.75		
06/710	0613	53	17	5			30	5575			
12/710	1613	82	18	5		11	38	13	5.37		
04/720	1613	78	21	9	0	8	38	14	5.37		
06/710	0614	65	15	11		4	10	8512			
12/710	1614	92	18	8		7	10	8	6.00		
04/720	1614	85	11	8	0	6	10	7	5.50		
06/710	0615	103	9	14		25	8	11512			
12/710	1615	94	22	15		20	3	16	6.00		
04/720	1615	90	24	14	0	16	10	16	3.20		
06/710	0616	48	1	2		4	3	2310			
12/710	1616	55	1	2		8	5	3	5.25		
04/720	1616	73	0	5	0	4	14	4	5.25		
06/710	0617	92	11	31	20	20	38	22525			
12/710	1617	94	11	14		12	36	14	6.87		
04/720	1617	110	15	31	22	18	38	14	6.75		
06/710	0618	85	4	12		12	19	10562			
12/710	1618	90	5	13		10	14	10	6.25		
04/720	1618	90	5	13	0	14	16	11	6.37		
06/710	0619	55	11	12		7	10	10	30		
12/710	1619	71	11	8		6	14	7	4.67		
04/720	1619	85	13	12	0	7	14	10	5.50		
06/710	0620	78	22	15	20	16	29	19687			
12/710	1620	105	15	16	20	16	35	1710.50			
04/720	1620	94	23	24	26	25	36	2610.00			
06/710	0621	22									
12/710	1621								1.67		
04/720	1621	99	0	0	0	0	0	0	0.00		
06/710	0622	87	14	2		11		2172			
12/710	1622	116	23	3		14		5	1.28		
04/720	1622	122	23	3	0	23	0	8	1.89		
06/710	0623	110	34	16	20	12	37	23775			
12/710	1623	113	24	18	22	25	46	2712.00			
04/720	1623	105	53	33	28	25	58	3810.50			
06/710	0624	92	4	4		2	19	4360			
12/710	1624	80	1	1		6	16	3	4.83		
04/720	1624	87	1	4	0	3	22	2	4.83		
06/710	0625	132	9	22	20	23	39	20550			
12/710	1625	145	17	31	25	30	35	25	8.75		
04/720	1625	128	17	30	28	33	44	28	7.00		